Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.6167	0.317	8.333	0.068	16.05	0.014
0.6333	0.315	8.35	0.068	16.07	0.014
0.65	0.315	8.367	0.067	16.08	0.015
0.6667	0.313	8.383	0.067	16.1	0.014
0.6833	0.312	8.4	0.067	16.12	0.015
0.7	0.311	8.417	0.066	16.13	0.014
0.7167	0.31	8.433	0.067	16.15	0.014
0.7333	0.309	8.45	0.067	16.17	0.013
0.75	0.307	8.467	0.066	16.18	0.012
0.7667	0.307	8.483	0.066	16.2	0.014
0.7833	0.305	8.5	0.066	16.22	0.014
0.8	0.305	8.517	0.066	16.23	0.014
0.8167	0.304	8.533	0.065	16.25	0.013
0.8333	0.303	8.55	0.065	16.27	0.013
0.85	0.301	8.567	0.065	16.28	0.013
0.8667	0.3	8.583	0.065	16.3	0.013
0.8833	0.299	8.6	0.065	16.32	0.013
0.9	0.298	8.617	0.065	16.33	0.012
0.9167	0.297	8.633	0.064	16.35	0.013
0.9333	0.296	8.65	0.064	16.37	0.013
0.95	0.295	8.667	0.064	16.38	0.013
0.9667	0.294	8.683	0.063	16.4	0.013
0.9833	0.293	8.7	0.064	16.42	0.013
1.	0.292	8.717	0.063	16.43	0.013
1.017	0.291	8.733	0.064	16.45	0.012
1.033	0.29	8.75	0.063	16.47	0.012
1.05	0.29	8.767	0.063	16.48	0.013
1.067	0.289	8.783	0.063	16.5	0.012
1.083	0.287	8.8	0.062	16.52	0.012
1.1	0.286	8.817	0.062	16.53	0.012
1.117	0.285	8.833	0.061	16.55	0.012
1.133	0.284	8.85	0.062	16.57	0.012
1.15	0.283	8.867	0.062	16.58	0.012
1.167	0.282	8.883	0.062	16.6	0.012
1.183	0.282	8.9	0.061	16.62	0.012
1.2	0.28	8.917	0.061	16.63	0.012
1.217	0.279	8.933	0.06	16.65	0.012
1.233	0.278	8.95	0.06	16.67	0.012
1.25	0.277	8.967	0.06	16.68	0.012
1.267	0.276	8.983	0.06	16.7	0.012
1.283	0.276	9.	0.06	16.72	0.012
1.3	0.275	9.017	0.06	16.73	0.011
1.317	0.274	9.033	0.059	16.75	0.012
1.333	0.273	9.05	0.059	16.77	0.011
1.35	0.271	9.067	0.059	16.78	0.011
1.367	0.27	9.083	0.059	16.8	0.011
1.383	0.269	9.1	0.058	16.82	0.011
1.4	0.269	9.117	0.058	16.83	0.011
1.417	0.268	9.133	0.059	16.85	0.011
1.433	0.267	9.15	0.058	16.87	0.011
1.45	0.266	9.167	0.058	16.88	0.011
1.467	0.265	9.183	0.058	16.9	0.011
1.483	0.264	9.2	0.058	16.92	0.011
1.5	0.264	9.217	0.057	16.93	0.011
1.517	0.263	9.233	0.057	16.95	0.011
1.533	0.262	9.25	0.057	16.97	0.011
1.55	0.261	9.267	0.057	16.98	0.011
1.567	0.261	9.283	0.057	17.	0.01
1.583	0.26	9.3	0.057	17.02	0.011
1.6	0.258	9.317	0.057	17.03	0.01
1.617	0.256	9.333	0.056	17.05	0.011
1.633	0.256	9.35	0.056	17.07	0.011
1.65	0.255	9.367	0.056	17.08	0.011

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.667	0.255	9.383	0.055	17.1	0.011
1.683	0.255	9.4	0.055	17.12	0.011
1.7	0.254	9.417	0.056	17.13	0.011
1.717	0.253	9.433	0.055	17.15	0.01
1.733	0.252	9.45	0.054	17.17	0.01
1.75	0.25	9.467	0.054	17.18	0.01
1.767	0.25	9.483	0.054	17.2	0.011
1.783	0.249	9.5	0.054	17.22	0.011
1.8	0.248	9.517	0.054	17.23	0.011
1.817	0.247	9.533	0.054	17.25	0.01
1.833	0.246	9.55	0.053	17.27	0.01
1.85	0.246	9.567	0.053	17.28	0.01
1.867	0.245	9.583	0.053	17.3	0.01
1.883	0.243	9.6	0.053	17.32	0.01
1.9	0.242	9.617	0.053	17.33	0.01
1.917	0.242	9.633	0.053	17.35	0.009
1.933	0.241	9.65	0.053	17.37	0.01
1.95	0.24	9.667	0.052	17.38	0.01
1.967	0.241	9.683	0.052	17.4	0.01
1.983	0.238	9.7	0.052	17.42	0.01
2.	0.238	9.717	0.052	17.43	0.01
2.017	0.237	9.733	0.052	17.45	0.01
2.033	0.238	9.75	0.052	17.47	0.009
2.05	0.236	9.767	0.052	17.48	0.01
2.067	0.235	9.783	0.052	17.5	0.01
2.083	0.234	9.8	0.051	17.52	0.009
2.1	0.233	9.817	0.051	17.53	0.009
2.117	0.232	9.833	0.051	17.55	0.009
2.133	0.231	9.85	0.051	17.57	0.01
2.15	0.233	9.867	0.051	17.58	0.009
2.167	0.229	9.883	0.051	17.6	0.009
2.183	0.23	9.9	0.05	17.62	0.01
2.2	0.23	9.917	0.05	17.63	0.01
2.217	0.228	9.933	0.05	17.65	0.009
2.233	0.227	9.95	0.05	17.67	0.009
2.25	0.227	9.967	0.049	17.68	0.01
2.267	0.226	9.983	0.05	17.7	0.009
2.283	0.225	10.	0.049	17.72	0.009
2.3	0.224	10.02	0.05	17.73	0.009
2.317	0.223	10.03	0.049	17.75	0.009
2.333	0.222	10.05	0.049	17.77	0.01
2.35	0.221	10.07	0.049	17.78	0.008
2.367	0.221	10.08	0.049	17.8	0.01
2.383	0.22	10.1	0.049	17.82	0.009
2.4	0.219	10.12	0.048	17.83	0.009
2.417	0.219	10.13	0.047	17.85	0.009
2.433	0.22	10.15	0.047	17.87	0.009
2.45	0.217	10.17	0.047	17.88	0.009
2.467	0.217	10.18	0.047	17.9	0.01
2.483	0.216	10.2	0.047	17.92	0.01
2.5	0.216	10.22	0.046	17.93	0.008
2.517	0.215	10.23	0.046	17.95	0.009
2.533	0.214	10.25	0.045	17.97	0.009
2.55	0.214	10.27	0.048	17.98	0.009
2.567	0.214	10.28	0.045	18.	0.009
2.583	0.213	10.3	0.046	18.02	0.009
2.6	0.211	10.32	0.045	18.03	0.008
2.617	0.21	10.33	0.048	18.05	0.008
2.633	0.21	10.35	0.045	18.07	0.008
2.65	0.209	10.37	0.045	18.08	0.008
2.667	0.209	10.38	0.045	18.1	0.009
2.683	0.207	10.4	0.045	18.12	0.008
2.7	0.206	10.42	0.045	18.13	0.008

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.717	0.206	10.43	0.044	18.15	0.009
2.733	0.205	10.45	0.044	18.17	0.008
2.75	0.205	10.47	0.045	18.18	0.008
2.767	0.204	10.48	0.045	18.2	0.007
2.783	0.204	10.5	0.045	18.22	0.009
2.8	0.203	10.52	0.044	18.23	0.009
2.817	0.202	10.53	0.044	18.25	0.009
2.833	0.202	10.55	0.043	18.27	0.008
2.85	0.2	10.57	0.045	18.28	0.008
2.867	0.2	10.58	0.044	18.3	0.008
2.883	0.199	10.6	0.044	18.32	0.008
2.9	0.199	10.62	0.043	18.33	0.008
2.917	0.198	10.63	0.044	18.35	0.008
2.933	0.198	10.65	0.043	18.37	0.007
2.95	0.197	10.67	0.043	18.38	0.008
2.967	0.197	10.68	0.042	18.4	0.008
2.983	0.196	10.7	0.042	18.42	0.008
3.	0.195	10.72	0.043	18.43	0.008
3.017	0.194	10.73	0.043	18.45	0.007
3.033	0.194	10.75	0.043	18.47	0.008
3.05	0.193	10.77	0.043	18.48	0.008
3.067	0.192	10.78	0.043	18.5	0.008
3.083	0.192	10.8	0.043	18.52	0.008
3.1	0.191	10.82	0.042	18.53	0.007
3.117	0.19	10.83	0.041	18.55	0.007
3.133	0.19	10.85	0.042	18.57	0.007
3.15	0.189	10.87	0.042	18.58	0.007
3.167	0.189	10.88	0.042	18.6	0.007
3.183	0.188	10.9	0.042	18.62	0.008
3.2	0.187	10.92	0.041	18.63	0.008
3.217	0.186	10.93	0.04	18.65	0.007
3.233	0.186	10.95	0.04	18.67	0.007
3.25	0.185	10.97	0.041	18.68	0.007
3.267	0.185	10.98	0.04	18.7	0.008
3.283	0.184	11.	0.04	18.72	0.007
3.3	0.184	11.02	0.04	18.73	0.007
3.317	0.183	11.03	0.04	18.75	0.007
3.333	0.182	11.05	0.04	18.77	0.007
3.35	0.182	11.07	0.04	18.78	0.007
3.367	0.181	11.08	0.04	18.8	0.007
3.383	0.18	11.1	0.039	18.82	0.007
3.4	0.18	11.12	0.039	18.83	0.007
3.417	0.179	11.13	0.039	18.85	0.007
3.433	0.179	11.15	0.039	18.87	0.007
3.45	0.178	11.17	0.039	18.88	0.007
3.467	0.178	11.18	0.039	18.9	0.007
3.483	0.177	11.2	0.039	18.92	0.007
3.5	0.176	11.22	0.038	18.93	0.007
3.517	0.176	11.23	0.038	18.95	0.007
3.533	0.175	11.25	0.038	18.97	0.006
3.55	0.175	11.27	0.039	18.98	0.007
3.567	0.174	11.28	0.039	19.	0.007
3.583	0.173	11.3	0.038	19.02	0.006
3.6	0.173	11.32	0.038	19.03	0.006
3.617	0.172	11.33	0.038	19.05	0.006
3.633	0.172	11.35	0.038	19.07	0.006
3.65	0.171	11.37	0.038	19.08	0.006
3.667	0.171	11.38	0.037	19.1	0.006
3.683	0.17	11.4	0.037	19.12	0.006
3.7	0.17	11.42	0.037	19.13	0.006
3.717	0.169	11.43	0.037	19.15	0.006
3.733	0.168	11.45	0.037	19.17	0.006
3.75	0.168	11.47	0.037	19.18	0.006

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.767	0.167	11.48	0.037	19.2	0.006
3.783	0.166	11.5	0.037	19.22	0.006
3.8	0.166	11.52	0.036	19.23	0.006
3.817	0.165	11.53	0.037	19.25	0.006
3.833	0.165	11.55	0.036	19.27	0.006
3.85	0.164	11.57	0.036	19.28	0.005
3.867	0.164	11.58	0.036	19.3	0.005
3.883	0.163	11.6	0.036	19.32	0.005
3.9	0.163	11.62	0.036	19.33	0.005
3.917	0.163	11.63	0.035	19.35	0.006
3.933	0.162	11.65	0.036	19.37	0.005
3.95	0.162	11.67	0.036	19.38	0.005
3.967	0.161	11.68	0.036	19.4	0.005
3.983	0.16	11.7	0.036	19.42	0.005
4.	0.159	11.72	0.035	19.43	0.005
4.017	0.159	11.73	0.035	19.45	0.005
4.033	0.158	11.75	0.035	19.47	0.005
4.05	0.158	11.77	0.035	19.48	0.005
4.067	0.157	11.78	0.035	19.5	0.005
4.083	0.157	11.8	0.035	19.52	0.005
4.1	0.156	11.82	0.035	19.53	0.005
4.117	0.157	11.83	0.034	19.55	0.005
4.133	0.155	11.85	0.035	19.57	0.005
4.15	0.155	11.87	0.034	19.58	0.005
4.167	0.154	11.88	0.034	19.6	0.005
4.183	0.154	11.9	0.034	19.62	0.005
4.2	0.154	11.92	0.033	19.63	0.005
4.217	0.153	11.93	0.033	19.65	0.005
4.233	0.152	11.95	0.033	19.67	0.005
4.25	0.152	11.97	0.033	19.68	0.005
4.267	0.151	11.98	0.033	19.7	0.005
4.283	0.15	12.	0.033	19.72	0.004
4.3	0.15	12.02	0.033	19.73	0.005
4.317	0.15	12.03	0.033	19.75	0.005
4.333	0.149	12.05	0.033	19.77	0.005
4.35	0.149	12.07	0.032	19.78	0.004
4.367	0.148	12.08	0.032	19.8	0.005
4.383	0.148	12.1	0.032	19.82	0.005
4.4	0.147	12.12	0.033	19.83	0.005
4.417	0.147	12.13	0.032	19.85	0.005
4.433	0.146	12.15	0.032	19.87	0.004
4.45	0.146	12.17	0.032	19.88	0.005
4.467	0.146	12.18	0.032	19.9	0.005
4.483	0.146	12.2	0.031	19.92	0.004
4.5	0.144	12.22	0.031	19.93	0.005
4.517	0.144	12.23	0.032	19.95	0.004
4.533	0.143	12.25	0.032	19.97	0.004
4.55	0.143	12.27	0.031	19.98	0.004
4.567	0.142	12.28	0.032	20.	0.004
4.583	0.142	12.3	0.031	20.02	0.004
4.6	0.142	12.32	0.031	20.03	0.004
4.617	0.141	12.33	0.031	20.05	0.004
4.633	0.141	12.35	0.031	20.07	0.004
4.65	0.14	12.37	0.031	20.08	0.005
4.667	0.14	12.38	0.031	20.1	0.004
4.683	0.139	12.4	0.031	20.12	0.004
4.7	0.139	12.42	0.031	20.13	0.004
4.717	0.138	12.43	0.031	20.15	0.004
4.733	0.138	12.45	0.03	20.17	0.004
4.75	0.137	12.47	0.031	20.18	0.004
4.767	0.137	12.48	0.03	20.2	0.004
4.783	0.137	12.5	0.03	20.22	0.004
4.8	0.136	12.52	0.03	20.23	0.004

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
4.817	0.136	12.53	0.03	20.25	0.004
4.833	0.135	12.55	0.03	20.27	0.004
4.85	0.135	12.57	0.03	20.28	0.004
4.867	0.134	12.58	0.03	20.3	0.004
4.883	0.134	12.6	0.03	20.32	0.004
4.9	0.134	12.62	0.03	20.33	0.004
4.917	0.133	12.63	0.03	20.35	0.004
4.933	0.133	12.65	0.029	20.37	0.004
4.95	0.132	12.67	0.03	20.38	0.004
4.967	0.132	12.68	0.029	20.4	0.004
4.983	0.131	12.7	0.029	20.42	0.004
5.	0.131	12.72	0.029	20.43	0.003
5.017	0.13	12.73	0.029	20.45	0.004
5.033	0.13	12.75	0.029	20.47	0.003
5.05	0.13	12.77	0.029	20.48	0.003
5.067	0.13	12.78	0.029	20.5	0.004
5.083	0.129	12.8	0.029	20.52	0.004
5.1	0.128	12.82	0.029	20.53	0.004
5.117	0.128	12.83	0.029	20.55	0.004
5.133	0.128	12.85	0.028	20.57	0.003
5.15	0.127	12.87	0.028	20.58	0.003
5.167	0.127	12.88	0.028	20.6	0.003
5.183	0.127	12.9	0.028	20.62	0.003
5.2	0.126	12.92	0.028	20.63	0.004
5.217	0.126	12.93	0.028	20.65	0.003
5.233	0.125	12.95	0.028	20.67	0.003
5.25	0.125	12.97	0.028	20.68	0.003
5.267	0.124	12.98	0.028	20.7	0.003
5.283	0.124	13.	0.027	20.72	0.003
5.3	0.123	13.02	0.028	20.73	0.003
5.317	0.123	13.03	0.027	20.75	0.004
5.333	0.123	13.05	0.027	20.77	0.003
5.35	0.122	13.07	0.027	20.78	0.003
5.367	0.122	13.08	0.027	20.8	0.003
5.383	0.121	13.1	0.026	20.82	0.003
5.4	0.121	13.12	0.026	20.83	0.003
5.417	0.12	13.13	0.026	20.85	0.003
5.433	0.12	13.15	0.026	20.87	0.003
5.45	0.12	13.17	0.026	20.88	0.003
5.467	0.12	13.18	0.026	20.9	0.003
5.483	0.119	13.2	0.026	20.92	0.003
5.5	0.119	13.22	0.026	20.93	0.003
5.517	0.119	13.23	0.026	20.95	0.003
5.533	0.119	13.25	0.026	20.97	0.003
5.55	0.117	13.27	0.026	20.98	0.003
5.567	0.117	13.28	0.025	21.	0.003
5.583	0.117	13.3	0.025	21.02	0.003
5.6	0.117	13.32	0.026	21.03	0.003
5.617	0.116	13.33	0.026	21.05	0.003
5.633	0.115	13.35	0.025	21.07	0.003
5.65	0.116	13.37	0.025	21.08	0.003
5.667	0.115	13.38	0.025	21.1	0.003
5.683	0.114	13.4	0.025	21.12	0.002
5.7	0.114	13.42	0.025	21.13	0.002
5.717	0.114	13.43	0.025	21.15	0.002
5.733	0.113	13.45	0.025	21.17	0.003
5.75	0.113	13.47	0.025	21.18	0.003
5.767	0.113	13.48	0.024	21.2	0.003
5.783	0.112	13.5	0.025	21.22	0.003
5.8	0.111	13.52	0.025	21.23	0.003
5.817	0.111	13.53	0.024	21.25	0.003
5.833	0.112	13.55	0.025	21.27	0.003
5.85	0.111	13.57	0.024	21.28	0.003

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.867	0.11	13.58	0.024	21.3	0.003
5.883	0.11	13.6	0.024	21.32	0.002
5.9	0.11	13.62	0.023	21.33	0.003
5.917	0.109	13.63	0.024	21.35	0.003
5.933	0.109	13.65	0.024	21.37	0.002
5.95	0.108	13.67	0.024	21.38	0.002
5.967	0.108	13.68	0.023	21.4	0.002
5.983	0.108	13.7	0.024	21.42	0.002
6.	0.108	13.72	0.024	21.43	0.002
6.017	0.107	13.73	0.024	21.45	0.003
6.033	0.107	13.75	0.024	21.47	0.002
6.05	0.106	13.77	0.023	21.48	0.002
6.067	0.106	13.78	0.023	21.5	0.002
6.083	0.106	13.8	0.024	21.52	0.002
6.1	0.106	13.82	0.023	21.53	0.002
6.117	0.105	13.83	0.023	21.55	0.002
6.133	0.106	13.85	0.023	21.57	0.003
6.15	0.105	13.87	0.023	21.58	0.002
6.167	0.105	13.88	0.023	21.6	0.003
6.183	0.103	13.9	0.023	21.62	0.002
6.2	0.104	13.92	0.023	21.63	0.002
6.217	0.104	13.93	0.022	21.65	0.002
6.233	0.102	13.95	0.022	21.67	0.002
6.25	0.102	13.97	0.022	21.68	0.002
6.267	0.102	13.98	0.022	21.7	0.002
6.283	0.102	14.	0.022	21.72	0.002
6.3	0.101	14.02	0.022	21.73	0.002
6.317	0.101	14.03	0.022	21.75	0.002
6.333	0.1	14.05	0.022	21.77	0.002
6.35	0.1	14.07	0.022	21.78	0.002
6.367	0.101	14.08	0.022	21.8	0.002
6.383	0.1	14.1	0.022	21.82	0.002
6.4	0.1	14.12	0.022	21.83	0.002
6.417	0.099	14.13	0.022	21.85	0.002
6.433	0.099	14.15	0.021	21.87	0.002
6.45	0.099	14.17	0.022	21.88	0.002
6.467	0.098	14.18	0.021	21.9	0.002
6.483	0.098	14.2	0.021	21.92	0.002
6.5	0.098	14.22	0.021	21.93	0.002
6.517	0.097	14.23	0.021	21.95	0.002
6.533	0.097	14.25	0.021	21.97	0.002
6.55	0.097	14.27	0.021	21.98	0.002
6.567	0.096	14.28	0.021	22.	0.002
6.583	0.096	14.3	0.021	22.02	0.002
6.6	0.095	14.32	0.021	22.03	0.002
6.617	0.095	14.33	0.021	22.05	0.002
6.633	0.095	14.35	0.02	22.07	0.002
6.65	0.094	14.37	0.021	22.08	0.001
6.667	0.094	14.38	0.021	22.1	0.002
6.683	0.094	14.4	0.02	22.12	0.002
6.7	0.094	14.42	0.021	22.13	0.002
6.717	0.093	14.43	0.02	22.15	0.002
6.733	0.094	14.45	0.019	22.17	0.001
6.75	0.093	14.47	0.02	22.18	0.001
6.767	0.092	14.48	0.02	22.2	0.002
6.783	0.092	14.5	0.019	22.22	0.001
6.8	0.092	14.52	0.02	22.23	0.001
6.817	0.092	14.53	0.019	22.25	0.001
6.833	0.092	14.55	0.019	22.27	0.001
6.85	0.091	14.57	0.019	22.28	0.002
6.867	0.091	14.58	0.019	22.3	0.001
6.883	0.091	14.6	0.02	22.32	0.001
6.9	0.09	14.62	0.019	22.33	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
6.917	0.089	14.63	0.019	22.35	0.001
6.933	0.089	14.65	0.019	22.37	0.002
6.95	0.089	14.67	0.019	22.38	0.001
6.967	0.089	14.68	0.019	22.4	0.001
6.983	0.089	14.7	0.019	22.42	0.001
7.	0.088	14.72	0.018	22.43	0.001
7.017	0.088	14.73	0.019	22.45	0.001
7.033	0.088	14.75	0.018	22.47	0.001
7.05	0.088	14.77	0.018	22.48	0.001
7.067	0.087	14.78	0.018	22.5	0.001
7.083	0.087	14.8	0.018	22.52	0.001
7.1	0.087	14.82	0.018	22.53	0.001
7.117	0.086	14.83	0.018	22.55	0.001
7.133	0.086	14.85	0.018	22.57	0.001
7.15	0.086	14.87	0.018	22.58	0.001
7.167	0.085	14.88	0.018	22.6	0.001
7.183	0.086	14.9	0.018	22.62	0.001
7.2	0.085	14.92	0.018	22.63	0.001
7.217	0.085	14.93	0.018	22.65	0.001
7.233	0.085	14.95	0.018	22.67	0.002
7.25	0.084	14.97	0.018	22.68	0.001
7.267	0.084	14.98	0.018	22.7	0.001
7.283	0.084	15.	0.018	22.72	0.001
7.3	0.084	15.02	0.017	22.73	0.001
7.317	0.083	15.03	0.017	22.75	0.001
7.333	0.083	15.05	0.017	22.77	0.001
7.35	0.082	15.07	0.018	22.78	0.001
7.367	0.082	15.08	0.018	22.8	0.001
7.383	0.082	15.1	0.017	22.82	0.001
7.4	0.081	15.12	0.017	22.83	0.001
7.417	0.081	15.13	0.017	22.85	0.001
7.433	0.081	15.15	0.017	22.87	0.001
7.45	0.081	15.17	0.017	22.88	0.001
7.467	0.08	15.18	0.017	22.9	0.001
7.483	0.08	15.2	0.017	22.92	0.001
7.5	0.08	15.22	0.017	22.93	0.001
7.517	0.08	15.23	0.017	22.95	0.001
7.533	0.079	15.25	0.017	22.97	0.001
7.55	0.079	15.27	0.017	22.98	0.001
7.567	0.079	15.28	0.017	23.	0.001
7.583	0.079	15.3	0.016	23.02	0.001
7.6	0.079	15.32	0.016	23.03	0.001
7.617	0.079	15.33	0.017	23.05	0.001
7.633	0.079	15.35	0.016	23.07	0.001
7.65	0.078	15.37	0.017	23.08	0.001
7.667	0.078	15.38	0.017	23.1	0.001
7.683	0.077	15.4	0.017	23.12	0.001
7.7	0.077	15.42	0.016	23.13	0.001
7.717	0.077	15.43	0.016	23.15	0.001
7.733	0.077	15.45	0.016	23.17	0.001
7.75	0.077	15.47	0.016	23.18	0.
7.767	0.077	15.48	0.016	23.2	0.001
7.783	0.076	15.5	0.016	23.22	0.
7.8	0.076	15.52	0.016		

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.003337	ft/min
y0	0.3576	ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	
K	0.003337	2.259E-06	ft/min
y0	0.3576	0.0001727	ft

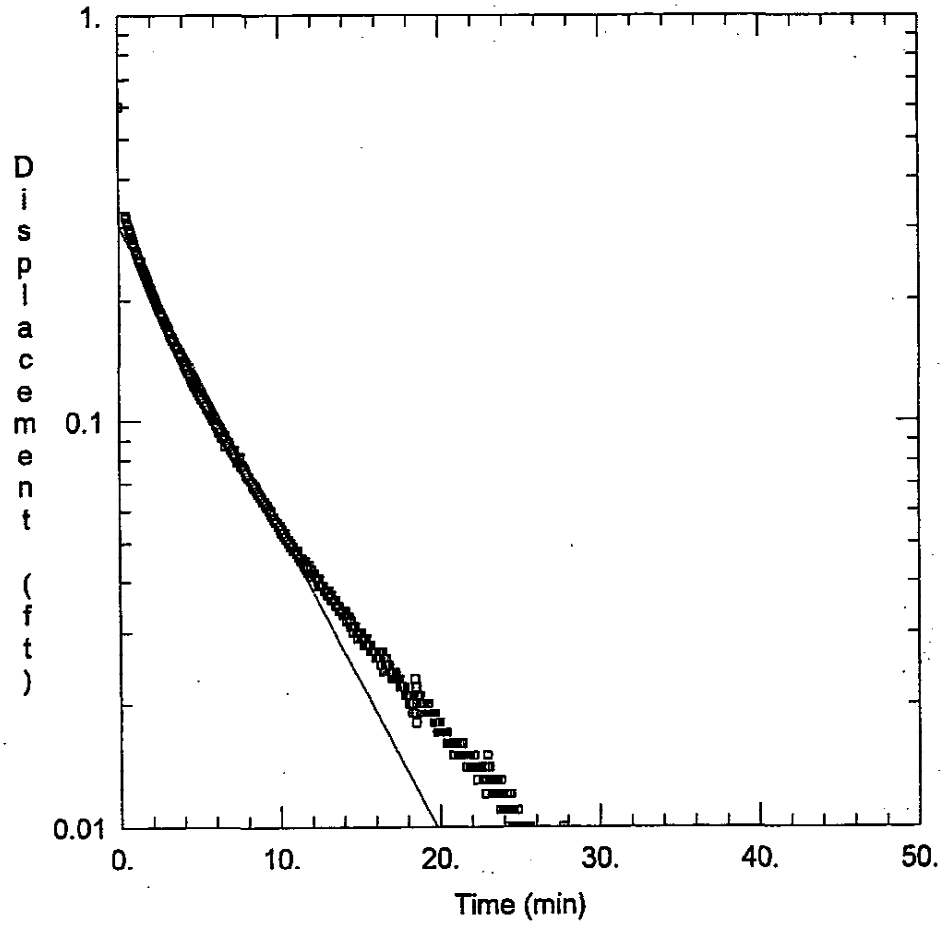
Parameter Correlations

	K	y0
K	1.00	0.72
y0	0.72	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.002846 ft^2
Variance . . . . . 2.053E-06 ft^2
Std. Deviation . . . . . 0.001433 ft
Mean . . . . . -0.0003329 ft
No. of Residuals . . . . . 1388.
No. of Estimates 2



W27 SLUG IN

Data Set: F:\...\w27 slug in.aqt
Date: 04/29/05 Time: 07:14:45

PROJECT INFORMATION

Company: Providence Engineering
Client: BFI Colonial
Project: 018-005
Test Location: Colonial Landfill
Test Well: W27 Slug In
Test Date: March 22, 2005

AQUIFER DATA

Saturated Thickness: 2. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W27 Slug In)

Initial Displacement: 0.6 ft
Wellbore Radius: 0.333 ft
Screen Length: 5. ft
Casing Radius: 0.333 ft
Well Skin Radius: 0.333 ft
Total Well Penetration Depth: 17.25 ft

SOLUTION

Aquifer Model: Unconfined
K = 0.005045 ft/min
Solution Method: Bouwer-Rice
y0 = 0.3025 ft

Data Set: F:\Projects\018 BFI\018 Projects\018-005\018-005 Work Folder\Task 16.0 Renewal Application\slug t
Title: W27 Slug In
Date: 04/29/05
Time: 07:14:51

PROJECT INFORMATION

Company: Providence Engineering
Client: BFI Colonial
Project: 018-005
Location: Colonial Landfill
Test Date: March 22, 2005
Test Well: W27 Slug In

AQUIFER DATA

Saturated Thickness: 2. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Initial Displacement: 0.6 ft
Casing Radius: 0.333 ft
Wellbore Radius: 0.333 ft
Well Skin Radius: 0.333 ft
Screen Length: 5. ft
Total Well Penetration Depth: 17.25 ft
Gravel Pack Porosity: 0.

No. of observations: 2527

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.4167	0.323	14.48	0.031	28.53	0.007
0.4333	0.321	14.5	0.031	28.55	0.007
0.45	0.318	14.52	0.031	28.57	0.007
0.4667	0.318	14.53	0.031	28.58	0.007
0.4833	0.316	14.55	0.031	28.6	0.007
0.5	0.313	14.57	0.031	28.62	0.007
0.5167	0.311	14.58	0.03	28.63	0.007
0.5333	0.31	14.6	0.031	28.65	0.007
0.55	0.308	14.62	0.031	28.67	0.007
0.5667	0.306	14.63	0.031	28.68	0.007
0.5833	0.305	14.65	0.031	28.7	0.007
0.6	0.303	14.67	0.031	28.72	0.006
0.6167	0.302	14.68	0.031	28.73	0.007
0.6333	0.3	14.7	0.031	28.75	0.007
0.65	0.299	14.72	0.031	28.77	0.007
0.6833	0.296	14.73	0.031	28.78	0.007
0.7	0.295	14.75	0.03	28.8	0.007
0.7167	0.292	14.77	0.03	28.82	0.007
0.7333	0.291	14.78	0.03	28.83	0.007
0.75	0.29	14.8	0.03	28.85	0.007
0.7667	0.289	14.82	0.03	28.87	0.007
0.7833	0.286	14.83	0.03	28.88	0.007
0.8	0.285	14.85	0.03	28.9	0.007
0.8167	0.284	14.87	0.03	28.92	0.007
0.8333	0.283	14.88	0.029	28.93	0.007
0.85	0.281	14.9	0.03	28.95	0.007
0.8667	0.281	14.92	0.03	28.97	0.007
0.8833	0.279	14.93	0.03	28.98	0.007
0.9	0.277	14.95	0.03	29.	0.007
0.9167	0.276	14.97	0.03	29.02	0.007
0.9333	0.275	14.98	0.03	29.03	0.007

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.95	0.274	15.	0.03	29.05	0.007
0.9667	0.272	15.02	0.029	29.07	0.007
0.9833	0.271	15.03	0.029	29.08	0.007
1.	0.27	15.05	0.03	29.1	0.007
1.017	0.269	15.07	0.03	29.12	0.006
1.033	0.267	15.08	0.029	29.13	0.007
1.05	0.266	15.1	0.03	29.15	0.006
1.067	0.265	15.12	0.029	29.17	0.007
1.083	0.265	15.13	0.029	29.18	0.006
1.1	0.262	15.15	0.029	29.2	0.007
1.117	0.261	15.17	0.029	29.22	0.007
1.133	0.261	15.18	0.029	29.23	0.007
1.15	0.258	15.2	0.029	29.25	0.006
1.167	0.257	15.22	0.029	29.27	0.007
1.183	0.257	15.23	0.029	29.28	0.006
1.2	0.257	15.25	0.029	29.3	0.006
1.217	0.254	15.27	0.029	29.32	0.007
1.233	0.254	15.28	0.028	29.33	0.006
1.25	0.252	15.3	0.029	29.35	0.006
1.267	0.251	15.32	0.029	29.37	0.007
1.283	0.25	15.33	0.029	29.38	0.006
1.3	0.248	15.35	0.028	29.4	0.006
1.317	0.249	15.37	0.029	29.42	0.006
1.333	0.247	15.38	0.029	29.43	0.006
1.35	0.249	15.4	0.028	29.45	0.006
1.367	0.243	15.42	0.029	29.47	0.006
1.383	0.249	15.43	0.028	29.48	0.006
1.4	0.244	15.45	0.028	29.5	0.006
1.417	0.242	15.47	0.028	29.52	0.006
1.433	0.241	15.48	0.028	29.53	0.006
1.45	0.241	15.5	0.028	29.55	0.006
1.467	0.239	15.52	0.028	29.57	0.007
1.483	0.238	15.53	0.028	29.58	0.006
1.5	0.239	15.55	0.028	29.6	0.006
1.517	0.237	15.57	0.028	29.62	0.006
1.533	0.236	15.58	0.028	29.63	0.006
1.55	0.235	15.6	0.028	29.65	0.006
1.567	0.234	15.62	0.028	29.67	0.006
1.583	0.233	15.63	0.028	29.68	0.006
1.6	0.232	15.65	0.027	29.7	0.006
1.617	0.231	15.67	0.028	29.72	0.006
1.633	0.231	15.68	0.028	29.73	0.006
1.65	0.229	15.7	0.028	29.75	0.005
1.667	0.229	15.72	0.027	29.77	0.006
1.683	0.228	15.73	0.027	29.78	0.006
1.7	0.227	15.75	0.027	29.8	0.006
1.717	0.227	15.77	0.027	29.82	0.006
1.733	0.225	15.78	0.027	29.83	0.006
1.75	0.224	15.8	0.027	29.85	0.006
1.767	0.224	15.82	0.027	29.87	0.006
1.783	0.222	15.83	0.027	29.88	0.006
1.8	0.222	15.85	0.027	29.9	0.006
1.817	0.221	15.87	0.027	29.92	0.006
1.833	0.22	15.88	0.027	29.93	0.006
1.85	0.219	15.9	0.027	29.95	0.006
1.867	0.219	15.92	0.027	29.97	0.006
1.883	0.217	15.93	0.027	29.98	0.006
1.9	0.216	15.95	0.027	30.	0.006
1.917	0.215	15.97	0.026	30.02	0.006
1.933	0.215	15.98	0.027	30.03	0.006
1.95	0.214	16.	0.027	30.05	0.006
1.967	0.213	16.02	0.027	30.07	0.006
1.983	0.213	16.03	0.027	30.08	0.006

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	0.212	16.05	0.027	30.1	0.006
2.017	0.21	16.07	0.026	30.12	0.006
2.033	0.21	16.08	0.026	30.13	0.006
2.05	0.209	16.1	0.026	30.15	0.006
2.067	0.208	16.12	0.027	30.17	0.006
2.083	0.208	16.13	0.026	30.18	0.006
2.1	0.207	16.15	0.026	30.2	0.006
2.117	0.206	16.17	0.027	30.22	0.006
2.133	0.205	16.18	0.026	30.23	0.006
2.15	0.205	16.2	0.026	30.25	0.006
2.167	0.204	16.22	0.026	30.27	0.006
2.183	0.203	16.23	0.027	30.28	0.006
2.2	0.202	16.25	0.027	30.3	0.006
2.217	0.202	16.27	0.026	30.32	0.005
2.233	0.201	16.28	0.026	30.33	0.005
2.25	0.201	16.3	0.027	30.35	0.006
2.267	0.2	16.32	0.025	30.37	0.005
2.283	0.198	16.33	0.027	30.38	0.006
2.3	0.198	16.35	0.027	30.4	0.006
2.317	0.197	16.37	0.027	30.42	0.005
2.333	0.197	16.38	0.025	30.43	0.005
2.35	0.196	16.4	0.027	30.45	0.005
2.367	0.195	16.42	0.027	30.47	0.005
2.383	0.194	16.43	0.026	30.48	0.005
2.4	0.193	16.45	0.024	30.5	0.005
2.417	0.192	16.47	0.026	30.52	0.005
2.433	0.191	16.48	0.026	30.53	0.006
2.45	0.19	16.5	0.026	30.55	0.005
2.467	0.19	16.52	0.026	30.57	0.006
2.483	0.189	16.53	0.024	30.58	0.005
2.5	0.188	16.55	0.024	30.6	0.006
2.517	0.188	16.57	0.025	30.62	0.006
2.533	0.188	16.58	0.025	30.63	0.006
2.55	0.186	16.6	0.025	30.65	0.006
2.567	0.187	16.62	0.025	30.67	0.006
2.583	0.186	16.63	0.026	30.68	0.006
2.6	0.185	16.65	0.024	30.7	0.006
2.617	0.185	16.67	0.025	30.72	0.006
2.633	0.185	16.68	0.025	30.73	0.006
2.65	0.183	16.7	0.025	30.75	0.006
2.667	0.182	16.72	0.025	30.77	0.006
2.683	0.182	16.73	0.025	30.78	0.005
2.7	0.182	16.75	0.025	30.8	0.005
2.717	0.181	16.77	0.024	30.82	0.006
2.733	0.18	16.78	0.024	30.83	0.006
2.75	0.18	16.8	0.024	30.85	0.005
2.767	0.18	16.82	0.025	30.87	0.006
2.783	0.178	16.83	0.024	30.88	0.005
2.8	0.178	16.85	0.024	30.9	0.006
2.817	0.177	16.87	0.024	30.92	0.005
2.833	0.176	16.88	0.024	30.93	0.006
2.85	0.176	16.9	0.024	30.95	0.005
2.867	0.176	16.92	0.024	30.97	0.005
2.883	0.175	16.93	0.024	30.98	0.005
2.9	0.174	16.95	0.024	31.	0.005
2.917	0.174	16.97	0.024	31.02	0.005
2.933	0.173	16.98	0.023	31.03	0.005
2.95	0.173	17.	0.024	31.05	0.005
2.967	0.171	17.02	0.024	31.07	0.005
2.983	0.172	17.03	0.024	31.08	0.005
3.	0.171	17.05	0.023	31.1	0.005
3.017	0.171	17.07	0.024	31.12	0.005
3.033	0.169	17.08	0.024	31.13	0.005

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.05	0.169	17.1	0.023	31.15	0.005
3.067	0.169	17.12	0.024	31.17	0.005
3.083	0.167	17.13	0.024	31.18	0.005
3.1	0.168	17.15	0.023	31.2	0.005
3.117	0.167	17.17	0.023	31.22	0.005
3.133	0.167	17.18	0.023	31.23	0.005
3.15	0.165	17.2	0.023	31.25	0.005
3.167	0.165	17.22	0.024	31.27	0.005
3.183	0.165	17.23	0.023	31.28	0.005
3.2	0.163	17.25	0.023	31.3	0.005
3.217	0.163	17.27	0.023	31.32	0.005
3.233	0.162	17.28	0.023	31.33	0.005
3.25	0.162	17.3	0.023	31.35	0.005
3.267	0.162	17.32	0.023	31.37	0.005
3.283	0.161	17.33	0.023	31.38	0.005
3.3	0.161	17.35	0.023	31.4	0.005
3.317	0.16	17.37	0.023	31.42	0.005
3.333	0.16	17.38	0.023	31.43	0.005
3.35	0.159	17.4	0.023	31.45	0.005
3.367	0.159	17.42	0.023	31.47	0.005
3.383	0.158	17.43	0.023	31.48	0.005
3.4	0.158	17.45	0.023	31.5	0.005
3.417	0.157	17.47	0.023	31.52	0.005
3.433	0.156	17.48	0.022	31.53	0.005
3.45	0.156	17.5	0.023	31.55	0.005
3.467	0.156	17.52	0.022	31.57	0.005
3.483	0.155	17.53	0.022	31.58	0.005
3.5	0.155	17.55	0.022	31.6	0.005
3.517	0.154	17.57	0.022	31.62	0.005
3.533	0.154	17.58	0.022	31.63	0.005
3.55	0.153	17.6	0.022	31.65	0.005
3.567	0.153	17.62	0.022	31.67	0.005
3.583	0.153	17.63	0.022	31.68	0.005
3.6	0.152	17.65	0.022	31.7	0.005
3.617	0.151	17.67	0.022	31.72	0.005
3.633	0.151	17.68	0.022	31.73	0.005
3.65	0.151	17.7	0.022	31.75	0.005
3.667	0.149	17.72	0.022	31.77	0.005
3.683	0.149	17.73	0.022	31.78	0.005
3.7	0.149	17.75	0.022	31.8	0.005
3.717	0.148	17.77	0.022	31.82	0.005
3.733	0.148	17.78	0.022	31.83	0.005
3.75	0.147	17.8	0.022	31.85	0.005
3.767	0.147	17.82	0.022	31.87	0.005
3.783	0.147	17.83	0.022	31.88	0.005
3.8	0.146	17.85	0.021	31.9	0.005
3.817	0.146	17.87	0.021	31.92	0.005
3.833	0.145	17.88	0.021	31.93	0.005
3.85	0.145	17.9	0.021	31.95	0.005
3.867	0.144	17.92	0.021	31.97	0.005
3.883	0.144	17.93	0.021	31.98	0.005
3.9	0.144	17.95	0.021	32.	0.005
3.917	0.142	17.97	0.021	32.02	0.005
3.933	0.142	17.98	0.021	32.03	0.005
3.95	0.142	18.	0.021	32.05	0.004
3.967	0.141	18.02	0.021	32.07	0.005
3.983	0.141	18.03	0.021	32.08	0.004
4.	0.14	18.05	0.021	32.1	0.005
4.017	0.14	18.07	0.021	32.12	0.005
4.033	0.14	18.08	0.021	32.13	0.005
4.05	0.139	18.1	0.02	32.15	0.005
4.067	0.139	18.12	0.02	32.17	0.005
4.083	0.138	18.13	0.021	32.18	0.005

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
4.1	0.138	18.15	0.021	32.2	0.005
4.117	0.138	18.17	0.021	32.22	0.005
4.133	0.137	18.18	0.021	32.23	0.004
4.15	0.137	18.2	0.021	32.25	0.005
4.167	0.136	18.22	0.02	32.27	0.005
4.183	0.136	18.23	0.02	32.28	0.005
4.2	0.135	18.25	0.021	32.3	0.005
4.217	0.135	18.27	0.02	32.32	0.004
4.233	0.134	18.28	0.02	32.33	0.004
4.25	0.134	18.3	0.019	32.35	0.004
4.267	0.134	18.32	0.02	32.37	0.004
4.283	0.133	18.33	0.021	32.38	0.005
4.3	0.133	18.35	0.02	32.4	0.004
4.317	0.132	18.37	0.021	32.42	0.005
4.333	0.132	18.38	0.02	32.43	0.005
4.35	0.132	18.4	0.02	32.45	0.004
4.367	0.131	18.42	0.019	32.47	0.005
4.383	0.131	18.43	0.021	32.48	0.005
4.4	0.131	18.45	0.023	32.5	0.004
4.417	0.131	18.47	0.022	32.52	0.004
4.433	0.13	18.48	0.02	32.53	0.004
4.45	0.13	18.5	0.019	32.55	0.004
4.467	0.13	18.52	0.019	32.57	0.005
4.483	0.129	18.53	0.018	32.58	0.004
4.5	0.128	18.55	0.021	32.6	0.005
4.517	0.128	18.57	0.02	32.62	0.005
4.533	0.128	18.58	0.022	32.63	0.005
4.55	0.127	18.6	0.021	32.65	0.003
4.567	0.126	18.62	0.021	32.67	0.002
4.583	0.126	18.63	0.021	32.68	0.002
4.6	0.126	18.65	0.021	32.7	0.003
4.617	0.125	18.67	0.02	32.72	0.007
4.633	0.125	18.68	0.021	32.73	0.005
4.65	0.125	18.7	0.02	32.75	0.005
4.667	0.125	18.72	0.02	32.77	0.003
4.683	0.124	18.73	0.021	32.78	0.003
4.7	0.123	18.75	0.02	32.8	0.004
4.717	0.122	18.77	0.021	32.82	0.006
4.733	0.123	18.78	0.02	32.83	0.007
4.75	0.122	18.8	0.02	32.85	0.009
4.767	0.122	18.82	0.02	32.87	0.003
4.783	0.122	18.83	0.02	32.88	0.005
4.8	0.121	18.85	0.02	32.9	0.004
4.817	0.121	18.87	0.02	32.92	0.007
4.833	0.121	18.88	0.02	32.93	0.006
4.85	0.12	18.9	0.02	32.95	0.004
4.867	0.12	18.92	0.02	32.97	0.005
4.883	0.12	18.93	0.02	32.98	0.005
4.9	0.119	18.95	0.02	33.	0.005
4.917	0.119	18.97	0.02	33.02	0.005
4.933	0.118	18.98	0.02	33.03	0.005
4.95	0.118	19.	0.02	33.05	0.004
4.967	0.118	19.02	0.02	33.07	0.005
4.983	0.118	19.03	0.019	33.08	0.005
5.	0.118	19.05	0.02	33.1	0.004
5.017	0.117	19.07	0.02	33.12	0.004
5.033	0.116	19.08	0.02	33.13	0.005
5.05	0.117	19.1	0.019	33.15	0.005
5.067	0.116	19.12	0.019	33.17	0.005
5.083	0.116	19.13	0.019	33.18	0.005
5.1	0.116	19.15	0.02	33.2	0.005
5.117	0.115	19.17	0.02	33.22	0.005
5.133	0.115	19.18	0.019	33.23	0.005

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.15	0.114	19.2	0.019	33.25	0.005
5.167	0.114	19.22	0.02	33.27	0.005
5.183	0.113	19.23	0.019	33.28	0.005
5.2	0.114	19.25	0.02	33.3	0.005
5.217	0.113	19.27	0.02	33.32	0.005
5.233	0.113	19.28	0.019	33.33	0.005
5.25	0.113	19.3	0.019	33.35	0.005
5.267	0.112	19.32	0.019	33.37	0.005
5.283	0.112	19.33	0.019	33.38	0.004
5.3	0.111	19.35	0.019	33.4	0.005
5.317	0.112	19.37	0.019	33.42	0.005
5.333	0.112	19.38	0.019	33.43	0.005
5.35	0.111	19.4	0.019	33.45	0.005
5.367	0.11	19.42	0.019	33.47	0.005
5.383	0.11	19.43	0.019	33.48	0.004
5.4	0.11	19.45	0.019	33.5	0.005
5.417	0.11	19.47	0.019	33.52	0.005
5.433	0.11	19.48	0.019	33.53	0.004
5.45	0.109	19.5	0.019	33.55	0.005
5.467	0.109	19.52	0.019	33.57	0.005
5.483	0.107	19.53	0.019	33.58	0.004
5.5	0.108	19.55	0.019	33.6	0.005
5.517	0.107	19.57	0.019	33.62	0.004
5.533	0.107	19.58	0.019	33.63	0.005
5.55	0.107	19.6	0.019	33.65	0.005
5.567	0.107	19.62	0.019	33.67	0.005
5.583	0.106	19.63	0.018	33.68	0.004
5.6	0.106	19.65	0.018	33.7	0.005
5.617	0.106	19.67	0.019	33.72	0.005
5.633	0.105	19.68	0.018	33.73	0.005
5.65	0.105	19.7	0.018	33.75	0.004
5.667	0.105	19.72	0.019	33.77	0.004
5.683	0.105	19.73	0.018	33.78	0.005
5.7	0.105	19.75	0.018	33.8	0.004
5.717	0.104	19.77	0.018	33.82	0.004
5.733	0.104	19.78	0.018	33.83	0.004
5.75	0.104	19.8	0.018	33.85	0.005
5.767	0.103	19.82	0.017	33.87	0.004
5.783	0.103	19.83	0.017	33.88	0.004
5.8	0.103	19.85	0.018	33.9	0.004
5.817	0.103	19.87	0.018	33.92	0.004
5.833	0.102	19.88	0.018	33.93	0.005
5.85	0.102	19.9	0.018	33.95	0.004
5.867	0.101	19.92	0.018	33.97	0.004
5.883	0.101	19.93	0.017	33.98	0.004
5.9	0.1	19.95	0.018	34.	0.004
5.917	0.1	19.97	0.018	34.02	0.004
5.933	0.1	19.98	0.017	34.03	0.005
5.95	0.1	20.	0.017	34.05	0.004
5.967	0.1	20.02	0.018	34.07	0.004
5.983	0.1	20.03	0.017	34.08	0.004
6.	0.099	20.05	0.017	34.1	0.004
6.017	0.099	20.07	0.017	34.12	0.004
6.033	0.099	20.08	0.017	34.13	0.004
6.05	0.098	20.1	0.017	34.15	0.004
6.067	0.098	20.12	0.017	34.17	0.004
6.083	0.097	20.13	0.017	34.18	0.004
6.1	0.097	20.15	0.017	34.2	0.004
6.117	0.097	20.17	0.017	34.22	0.004
6.133	0.097	20.18	0.017	34.23	0.004
6.15	0.097	20.2	0.017	34.25	0.004
6.167	0.097	20.22	0.017	34.27	0.004
6.183	0.096	20.23	0.017	34.28	0.004

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
6.2	0.096	20.25	0.017	34.3	0.004
6.217	0.097	20.27	0.017	34.32	0.003
6.233	0.094	20.28	0.017	34.33	0.004
6.25	0.095	20.3	0.017	34.35	0.003
6.267	0.094	20.32	0.017	34.37	0.003
6.283	0.094	20.33	0.017	34.38	0.004
6.3	0.095	20.35	0.017	34.4	0.003
6.317	0.094	20.37	0.017	34.42	0.004
6.333	0.095	20.38	0.017	34.43	0.004
6.35	0.094	20.4	0.017	34.45	0.004
6.367	0.093	20.42	0.016	34.47	0.004
6.383	0.092	20.43	0.017	34.48	0.004
6.4	0.094	20.45	0.016	34.5	0.003
6.417	0.094	20.47	0.016	34.52	0.003
6.433	0.092	20.48	0.016	34.53	0.003
6.45	0.091	20.5	0.016	34.55	0.003
6.467	0.092	20.52	0.016	34.57	0.003
6.483	0.091	20.53	0.016	34.58	0.004
6.5	0.092	20.55	0.016	34.6	0.004
6.517	0.091	20.57	0.016	34.62	0.004
6.533	0.092	20.58	0.016	34.63	0.004
6.55	0.09	20.6	0.016	34.65	0.004
6.567	0.09	20.62	0.016	34.67	0.004
6.583	0.092	20.63	0.016	34.68	0.003
6.6	0.087	20.65	0.016	34.7	0.003
6.617	0.092	20.67	0.016	34.72	0.003
6.633	0.092	20.68	0.016	34.73	0.004
6.65	0.09	20.7	0.016	34.75	0.003
6.667	0.09	20.72	0.016	34.77	0.003
6.683	0.089	20.73	0.016	34.78	0.003
6.7	0.089	20.75	0.016	34.8	0.003
6.717	0.09	20.77	0.016	34.82	0.004
6.733	0.09	20.78	0.016	34.83	0.003
6.75	0.089	20.8	0.016	34.85	0.003
6.767	0.089	20.82	0.015	34.87	0.003
6.783	0.088	20.83	0.016	34.88	0.003
6.8	0.089	20.85	0.016	34.9	0.003
6.817	0.088	20.87	0.016	34.92	0.003
6.833	0.088	20.88	0.016	34.93	0.003
6.85	0.087	20.9	0.016	34.95	0.003
6.867	0.087	20.92	0.016	34.97	0.003
6.883	0.089	20.93	0.015	34.98	0.003
6.9	0.088	20.95	0.016	35.	0.003
6.917	0.086	20.97	0.016	35.02	0.003
6.933	0.086	20.98	0.016	35.03	0.003
6.95	0.086	21.	0.016	35.05	0.003
6.967	0.086	21.02	0.016	35.07	0.003
6.983	0.085	21.03	0.016	35.08	0.003
7.	0.085	21.05	0.016	35.1	0.003
7.017	0.085	21.07	0.016	35.12	0.003
7.033	0.085	21.08	0.015	35.13	0.003
7.05	0.085	21.1	0.015	35.15	0.003
7.067	0.084	21.12	0.015	35.17	0.003
7.083	0.085	21.13	0.015	35.18	0.003
7.1	0.084	21.15	0.015	35.2	0.003
7.117	0.085	21.17	0.016	35.22	0.003
7.133	0.084	21.18	0.015	35.23	0.003
7.15	0.084	21.2	0.016	35.25	0.003
7.167	0.085	21.22	0.016	35.27	0.003
7.183	0.083	21.23	0.015	35.28	0.003
7.2	0.084	21.25	0.015	35.3	0.003
7.217	0.085	21.27	0.015	35.32	0.003
7.233	0.083	21.28	0.015	35.33	0.003

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
7.25	0.082	21.3	0.015	35.35	0.003
7.267	0.082	21.32	0.016	35.37	0.003
7.283	0.082	21.33	0.015	35.38	0.003
7.3	0.081	21.35	0.015	35.4	0.003
7.317	0.081	21.37	0.016	35.42	0.003
7.333	0.082	21.38	0.016	35.43	0.003
7.35	0.08	21.4	0.015	35.45	0.003
7.367	0.079	21.42	0.015	35.47	0.003
7.383	0.08	21.43	0.015	35.48	0.003
7.4	0.08	21.45	0.015	35.5	0.003
7.417	0.08	21.47	0.015	35.52	0.003
7.433	0.08	21.48	0.015	35.53	0.002
7.45	0.08	21.5	0.015	35.55	0.003
7.467	0.079	21.52	0.015	35.57	0.003
7.483	0.079	21.53	0.015	35.58	0.003
7.5	0.079	21.55	0.015	35.6	0.002
7.517	0.079	21.57	0.015	35.62	0.003
7.533	0.079	21.58	0.015	35.63	0.003
7.55	0.081	21.6	0.015	35.65	0.003
7.567	0.082	21.62	0.015	35.67	0.003
7.583	0.077	21.63	0.015	35.68	0.003
7.6	0.078	21.65	0.014	35.7	0.002
7.617	0.077	21.67	0.015	35.72	0.003
7.633	0.078	21.68	0.015	35.73	0.002
7.65	0.077	21.7	0.015	35.75	0.003
7.667	0.077	21.72	0.015	35.77	0.003
7.683	0.078	21.73	0.015	35.78	0.002
7.7	0.077	21.75	0.015	35.8	0.003
7.717	0.078	21.77	0.015	35.82	0.003
7.733	0.077	21.78	0.015	35.83	0.002
7.75	0.076	21.8	0.015	35.85	0.003
7.767	0.077	21.82	0.015	35.87	0.003
7.783	0.077	21.83	0.015	35.88	0.002
7.8	0.077	21.85	0.014	35.9	0.003
7.817	0.076	21.87	0.015	35.92	0.003
7.833	0.076	21.88	0.015	35.93	0.003
7.85	0.076	21.9	0.014	35.95	0.003
7.867	0.076	21.92	0.014	35.97	0.003
7.883	0.075	21.93	0.014	35.98	0.003
7.9	0.075	21.95	0.014	36.	0.003
7.917	0.075	21.97	0.014	36.02	0.003
7.933	0.074	21.98	0.014	36.03	0.003
7.95	0.073	22.	0.014	36.05	0.003
7.967	0.074	22.02	0.014	36.07	0.003
7.983	0.073	22.03	0.014	36.08	0.002
8.	0.073	22.05	0.014	36.1	0.003
8.017	0.073	22.07	0.014	36.12	0.003
8.033	0.073	22.08	0.015	36.13	0.003
8.05	0.072	22.1	0.014	36.15	0.002
8.067	0.073	22.12	0.014	36.17	0.003
8.083	0.072	22.13	0.014	36.18	0.003
8.1	0.073	22.15	0.015	36.2	0.003
8.117	0.072	22.17	0.014	36.22	0.002
8.133	0.072	22.18	0.014	36.23	0.002
8.15	0.072	22.2	0.014	36.25	0.002
8.167	0.071	22.22	0.014	36.27	0.003
8.183	0.071	22.23	0.014	36.28	0.002
8.2	0.071	22.25	0.014	36.3	0.002
8.217	0.071	22.27	0.014	36.32	0.003
8.233	0.071	22.28	0.014	36.33	0.002
8.25	0.071	22.3	0.014	36.35	0.003
8.267	0.071	22.32	0.013	36.37	0.003
8.283	0.071	22.33	0.014	36.38	0.002

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
8.3	0.07	22.35	0.014	36.4	0.002
8.317	0.07	22.37	0.014	36.42	0.002
8.333	0.07	22.38	0.014	36.43	0.002
8.35	0.069	22.4	0.014	36.45	0.002
8.367	0.07	22.42	0.014	36.47	0.002
8.383	0.07	22.43	0.014	36.48	0.002
8.4	0.069	22.45	0.014	36.5	0.002
8.417	0.068	22.47	0.014	36.52	0.003
8.433	0.069	22.48	0.014	36.53	0.002
8.45	0.069	22.5	0.014	36.55	0.002
8.467	0.068	22.52	0.014	36.57	0.002
8.483	0.068	22.53	0.014	36.58	0.002
8.5	0.069	22.55	0.014	36.6	0.002
8.517	0.069	22.57	0.014	36.62	0.002
8.533	0.068	22.58	0.014	36.63	0.002
8.55	0.068	22.6	0.014	36.65	0.002
8.567	0.067	22.62	0.014	36.67	0.002
8.583	0.068	22.63	0.014	36.68	0.002
8.6	0.067	22.65	0.013	36.7	0.002
8.617	0.067	22.67	0.013	36.72	0.002
8.633	0.066	22.68	0.013	36.73	0.002
8.65	0.067	22.7	0.013	36.75	0.002
8.667	0.066	22.72	0.014	36.77	0.002
8.683	0.066	22.73	0.014	36.78	0.002
8.7	0.066	22.75	0.013	36.8	0.002
8.717	0.066	22.77	0.013	36.82	0.002
8.733	0.066	22.78	0.014	36.83	0.002
8.75	0.066	22.8	0.013	36.85	0.002
8.767	0.065	22.82	0.013	36.87	0.002
8.783	0.065	22.83	0.013	36.88	0.002
8.8	0.065	22.85	0.014	36.9	0.002
8.817	0.065	22.87	0.012	36.92	0.002
8.833	0.065	22.88	0.013	36.93	0.002
8.85	0.065	22.9	0.012	36.95	0.002
8.867	0.065	22.92	0.014	36.97	0.002
8.883	0.065	22.93	0.013	36.98	0.002
8.9	0.064	22.95	0.015	37.	0.002
8.917	0.064	22.97	0.015	37.02	0.002
8.933	0.064	22.98	0.014	37.03	0.002
8.95	0.064	23.	0.014	37.05	0.002
8.967	0.063	23.02	0.013	37.07	0.002
8.983	0.063	23.03	0.013	37.08	0.002
9.	0.063	23.05	0.013	37.1	0.001
9.017	0.063	23.07	0.013	37.12	0.002
9.033	0.063	23.08	0.014	37.13	0.002
9.05	0.063	23.1	0.014	37.15	0.002
9.067	0.063	23.12	0.013	37.17	0.002
9.083	0.063	23.13	0.013	37.18	0.002
9.1	0.062	23.15	0.013	37.2	0.002
9.117	0.063	23.17	0.013	37.22	0.002
9.133	0.062	23.18	0.013	37.23	0.002
9.15	0.062	23.2	0.013	37.25	0.002
9.167	0.062	23.22	0.012	37.27	0.002
9.183	0.062	23.23	0.012	37.28	0.002
9.2	0.062	23.25	0.013	37.3	0.002
9.217	0.061	23.27	0.013	37.32	0.002
9.233	0.062	23.28	0.013	37.33	0.002
9.25	0.062	23.3	0.013	37.35	0.002
9.267	0.061	23.32	0.013	37.37	0.002
9.283	0.061	23.33	0.013	37.38	0.002
9.3	0.061	23.35	0.012	37.4	0.002
9.317	0.061	23.37	0.013	37.42	0.002
9.333	0.061	23.38	0.013	37.43	0.002

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
9.35	0.061	23.4	0.013	37.45	0.002
9.367	0.06	23.42	0.013	37.47	0.002
9.383	0.06	23.43	0.013	37.48	0.002
9.4	0.06	23.45	0.013	37.5	0.002
9.417	0.06	23.47	0.012	37.52	0.002
9.433	0.06	23.48	0.012	37.53	0.002
9.45	0.06	23.5	0.012	37.55	0.002
9.467	0.06	23.52	0.013	37.57	0.002
9.483	0.059	23.53	0.012	37.58	0.002
9.5	0.059	23.55	0.013	37.6	0.002
9.517	0.059	23.57	0.012	37.62	0.002
9.533	0.058	23.58	0.012	37.63	0.002
9.55	0.058	23.6	0.013	37.65	0.001
9.567	0.058	23.62	0.012	37.67	0.002
9.583	0.058	23.63	0.012	37.68	0.002
9.6	0.058	23.65	0.012	37.7	0.001
9.617	0.058	23.67	0.012	37.72	0.002
9.633	0.057	23.68	0.012	37.73	0.001
9.65	0.058	23.7	0.012	37.75	0.001
9.667	0.057	23.72	0.012	37.77	0.002
9.683	0.057	23.73	0.012	37.78	0.002
9.7	0.057	23.75	0.011	37.8	0.002
9.717	0.057	23.77	0.012	37.82	0.002
9.733	0.057	23.78	0.013	37.83	0.001
9.75	0.056	23.8	0.011	37.85	0.002
9.767	0.056	23.82	0.012	37.87	0.001
9.783	0.056	23.83	0.012	37.88	0.002
9.8	0.056	23.85	0.012	37.9	0.002
9.817	0.056	23.87	0.012	37.92	0.002
9.833	0.056	23.88	0.012	37.93	0.002
9.85	0.056	23.9	0.012	37.95	0.002
9.867	0.056	23.92	0.011	37.97	0.001
9.883	0.056	23.93	0.011	37.98	0.001
9.9	0.055	23.95	0.011	38.	0.001
9.917	0.055	23.97	0.012	38.02	0.002
9.933	0.055	23.98	0.012	38.03	0.001
9.95	0.055	24.	0.012	38.05	0.001
9.967	0.055	24.02	0.011	38.07	0.001
9.983	0.055	24.03	0.011	38.08	0.001
10.	0.054	24.05	0.011	38.1	0.002
10.02	0.054	24.07	0.011	38.12	0.002
10.03	0.054	24.08	0.012	38.13	0.002
10.05	0.054	24.1	0.011	38.15	0.001
10.07	0.055	24.12	0.012	38.17	0.001
10.08	0.054	24.13	0.011	38.18	0.002
10.1	0.053	24.15	0.012	38.2	0.002
10.12	0.054	24.17	0.012	38.22	0.001
10.13	0.053	24.18	0.012	38.23	0.002
10.15	0.054	24.2	0.011	38.25	0.001
10.17	0.053	24.22	0.012	38.27	0.001
10.18	0.053	24.23	0.011	38.28	0.002
10.2	0.053	24.25	0.011	38.3	0.001
10.22	0.053	24.27	0.01	38.32	0.001
10.23	0.053	24.28	0.011	38.33	0.001
10.25	0.052	24.3	0.012	38.35	0.001
10.27	0.053	24.32	0.012	38.37	0.001
10.28	0.053	24.33	0.011	38.38	0.002
10.3	0.052	24.35	0.012	38.4	0.001
10.32	0.053	24.37	0.011	38.42	0.002
10.33	0.052	24.38	0.011	38.43	0.002
10.35	0.052	24.4	0.011	38.45	0.001
10.37	0.052	24.42	0.012	38.47	0.001
10.38	0.052	24.43	0.011	38.48	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
10.4	0.051	24.45	0.011	38.5	0.001
10.42	0.051	24.47	0.011	38.52	0.001
10.43	0.051	24.48	0.011	38.53	0.001
10.45	0.051	24.5	0.011	38.55	0.001
10.47	0.051	24.52	0.01	38.57	0.001
10.48	0.051	24.53	0.01	38.58	0.001
10.5	0.051	24.55	0.011	38.6	0.001
10.52	0.051	24.57	0.01	38.62	0.001
10.53	0.051	24.58	0.011	38.63	0.001
10.55	0.05	24.6	0.011	38.65	0.002
10.57	0.051	24.62	0.01	38.67	0.001
10.58	0.05	24.63	0.01	38.68	0.001
10.6	0.05	24.65	0.01	38.7	0.001
10.62	0.05	24.67	0.01	38.72	0.001
10.63	0.05	24.68	0.009	38.73	0.001
10.65	0.049	24.7	0.009	38.75	0.001
10.67	0.049	24.72	0.01	38.77	0.001
10.68	0.05	24.73	0.01	38.78	0.001
10.7	0.05	24.75	0.01	38.8	0.001
10.72	0.049	24.77	0.01	38.82	0.001
10.73	0.049	24.78	0.01	38.83	0.001
10.75	0.049	24.8	0.01	38.85	0.001
10.77	0.049	24.82	0.01	38.87	0.001
10.78	0.049	24.83	0.011	38.88	0.002
10.8	0.049	24.85	0.011	38.9	0.001
10.82	0.049	24.87	0.01	38.92	0.001
10.83	0.048	24.88	0.01	38.93	0.001
10.85	0.049	24.9	0.01	38.95	0.001
10.87	0.049	24.92	0.01	38.97	0.001
10.88	0.048	24.93	0.01	38.98	0.001
10.9	0.048	24.95	0.01	39.	0.001
10.92	0.048	24.97	0.01	39.02	0.001
10.93	0.048	24.98	0.01	39.03	0.001
10.95	0.048	25.	0.009	39.05	0.001
10.97	0.048	25.02	0.01	39.07	0.001
10.98	0.048	25.03	0.01	39.08	0.001
11.	0.048	25.05	0.009	39.1	0.001
11.02	0.048	25.07	0.01	39.12	0.001
11.03	0.048	25.08	0.01	39.13	0.001
11.05	0.048	25.1	0.01	39.15	0.001
11.07	0.047	25.12	0.01	39.17	0.001
11.08	0.048	25.13	0.01	39.18	0.001
11.1	0.048	25.15	0.01	39.2	0.001
11.12	0.048	25.17	0.01	39.22	0.001
11.13	0.047	25.18	0.01	39.23	0.001
11.15	0.047	25.2	0.01	39.25	0.001
11.17	0.046	25.22	0.01	39.27	0.001
11.18	0.046	25.23	0.01	39.28	0.001
11.2	0.046	25.25	0.01	39.3	0.001
11.22	0.046	25.27	0.01	39.32	0.001
11.23	0.046	25.28	0.009	39.33	0.001
11.25	0.046	25.3	0.01	39.35	0.001
11.27	0.046	25.32	0.01	39.37	0.001
11.28	0.046	25.33	0.01	39.38	0.001
11.3	0.045	25.35	0.009	39.4	0.001
11.32	0.046	25.37	0.009	39.42	0.001
11.33	0.046	25.38	0.01	39.43	0.001
11.35	0.046	25.4	0.01	39.45	0.001
11.37	0.045	25.42	0.009	39.47	0.
11.38	0.045	25.43	0.01	39.48	0.002
11.4	0.046	25.45	0.009	39.5	0.
11.42	0.045	25.47	0.009	39.52	0.001
11.43	0.045	25.48	0.01	39.53	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
11.45	0.045	25.5	0.009	39.55	0.001
11.47	0.045	25.52	0.009	39.57	0.001
11.48	0.045	25.53	0.009	39.58	0.001
11.5	0.044	25.55	0.009	39.6	0.001
11.52	0.045	25.57	0.009	39.62	0.
11.53	0.045	25.58	0.01	39.63	0.
11.55	0.045	25.6	0.009	39.65	0.001
11.57	0.045	25.62	0.009	39.67	0.003
11.58	0.044	25.63	0.009	39.68	0.
11.6	0.045	25.65	0.009	39.7	0.001
11.62	0.044	25.67	0.009	39.72	0.001
11.63	0.044	25.68	0.009	39.73	0.003
11.65	0.044	25.7	0.009	39.75	0.002
11.67	0.043	25.72	0.008	39.77	0.002
11.68	0.044	25.73	0.009	39.78	0.002
11.7	0.043	25.75	0.009	39.8	-0.001
11.72	0.044	25.77	0.009	39.82	0.004
11.73	0.044	25.78	0.009	39.83	-0.001
11.75	0.043	25.8	0.009	39.85	-0.002
11.77	0.043	25.82	0.009	39.87	0.003
11.78	0.043	25.83	0.009	39.88	0.001
11.8	0.043	25.85	0.009	39.9	0.
11.82	0.044	25.87	0.009	39.92	0.003
11.83	0.042	25.88	0.009	39.93	0.001
11.85	0.042	25.9	0.009	39.95	0.003
11.87	0.042	25.92	0.009	39.97	0.002
11.88	0.042	25.93	0.009	39.98	0.002
11.9	0.043	25.95	0.009	40.	0.001
11.92	0.042	25.97	0.009	40.02	0.001
11.93	0.042	25.98	0.009	40.03	0.002
11.95	0.043	26.	0.009	40.05	0.001
11.97	0.042	26.02	0.009	40.07	0.001
11.98	0.042	26.03	0.009	40.08	0.001
12.	0.041	26.05	0.009	40.1	0.002
12.02	0.042	26.07	0.009	40.12	0.002
12.03	0.042	26.08	0.009	40.13	0.002
12.05	0.042	26.1	0.009	40.15	0.001
12.07	0.042	26.12	0.009	40.17	0.001
12.08	0.042	26.13	0.009	40.18	0.001
12.1	0.042	26.15	0.009	40.2	0.001
12.12	0.041	26.17	0.009	40.22	0.002
12.13	0.041	26.18	0.009	40.23	0.002
12.15	0.042	26.2	0.009	40.25	0.002
12.17	0.041	26.22	0.009	40.27	0.001
12.18	0.041	26.23	0.008	40.28	0.001
12.2	0.041	26.25	0.009	40.3	0.001
12.22	0.041	26.27	0.008	40.32	0.001
12.23	0.041	26.28	0.009	40.33	0.001
12.25	0.041	26.3	0.009	40.35	0.001
12.27	0.041	26.32	0.008	40.37	0.001
12.28	0.041	26.33	0.008	40.38	0.001
12.3	0.041	26.35	0.008	40.4	0.001
12.32	0.041	26.37	0.008	40.42	0.001
12.33	0.041	26.38	0.008	40.43	0.001
12.35	0.04	26.4	0.008	40.45	0.001
12.37	0.041	26.42	0.008	40.47	0.001
12.38	0.04	26.43	0.008	40.48	0.001
12.4	0.04	26.45	0.008	40.5	0.001
12.42	0.039	26.47	0.008	40.52	0.001
12.43	0.04	26.48	0.008	40.53	0.001
12.45	0.041	26.5	0.008	40.55	0.
12.47	0.039	26.52	0.008	40.57	0.001
12.48	0.039	26.53	0.008	40.58	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
12.5	0.039	26.55	0.009	40.6	0.001
12.52	0.039	26.57	0.008	40.62	0.001
12.53	0.039	26.58	0.008	40.63	0.001
12.55	0.039	26.6	0.008	40.65	0.001
12.57	0.039	26.62	0.008	40.67	0.001
12.58	0.039	26.63	0.008	40.68	0.001
12.6	0.039	26.65	0.008	40.7	0.001
12.62	0.039	26.67	0.008	40.72	0.001
12.63	0.039	26.68	0.008	40.73	0.001
12.65	0.039	26.7	0.008	40.75	0.001
12.67	0.039	26.72	0.008	40.77	0.001
12.68	0.039	26.73	0.008	40.78	0.001
12.7	0.039	26.75	0.008	40.8	0.001
12.72	0.039	26.77	0.009	40.82	0.001
12.73	0.039	26.78	0.008	40.83	0.001
12.75	0.038	26.8	0.008	40.85	0.001
12.77	0.038	26.82	0.008	40.87	0.001
12.78	0.038	26.83	0.008	40.88	0.001
12.8	0.038	26.85	0.008	40.9	0.001
12.82	0.038	26.87	0.008	40.92	0.001
12.83	0.038	26.88	0.008	40.93	0.001
12.85	0.038	26.9	0.008	40.95	0.001
12.87	0.038	26.92	0.008	40.97	0.001
12.88	0.038	26.93	0.008	40.98	0.001
12.9	0.038	26.95	0.008	41.	0.001
12.92	0.038	26.97	0.008	41.02	0.001
12.93	0.038	26.98	0.008	41.03	0.001
12.95	0.038	27.	0.008	41.05	0.001
12.97	0.037	27.02	0.008	41.07	0.001
12.98	0.038	27.03	0.008	41.08	0.001
13.	0.037	27.05	0.009	41.1	0.001
13.02	0.037	27.07	0.009	41.12	0.001
13.03	0.037	27.08	0.008	41.13	0.001
13.05	0.037	27.1	0.008	41.15	0.001
13.07	0.038	27.12	0.008	41.17	0.001
13.08	0.037	27.13	0.008	41.18	0.001
13.1	0.037	27.15	0.008	41.2	0.001
13.12	0.037	27.17	0.008	41.22	0.001
13.13	0.037	27.18	0.008	41.23	0.001
13.15	0.037	27.2	0.008	41.25	0.001
13.17	0.037	27.22	0.008	41.27	0.001
13.18	0.037	27.23	0.008	41.28	0.001
13.2	0.037	27.25	0.008	41.3	0.001
13.22	0.036	27.27	0.008	41.32	0.001
13.23	0.037	27.28	0.008	41.33	0.001
13.25	0.037	27.3	0.008	41.35	0.001
13.27	0.036	27.32	0.008	41.37	0.001
13.28	0.036	27.33	0.008	41.38	0.001
13.3	0.036	27.35	0.008	41.4	0.001
13.32	0.036	27.37	0.008	41.42	0.001
13.33	0.036	27.38	0.008	41.43	0.001
13.35	0.036	27.4	0.008	41.45	0.001
13.37	0.036	27.42	0.008	41.47	0.001
13.38	0.036	27.43	0.008	41.48	0.001
13.4	0.036	27.45	0.008	41.5	0.001
13.42	0.036	27.47	0.008	41.52	0.001
13.43	0.036	27.48	0.008	41.53	0.001
13.45	0.035	27.5	0.008	41.55	0.001
13.47	0.036	27.52	0.006	41.57	0.001
13.48	0.035	27.53	0.007	41.58	0.001
13.5	0.036	27.55	0.007	41.6	0.001
13.52	0.035	27.57	0.007	41.62	0.001
13.53	0.035	27.58	0.008	41.63	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
13.55	0.035	27.6	0.008	41.65	0.001
13.57	0.035	27.62	0.008	41.67	0.001
13.58	0.035	27.63	0.009	41.68	0.001
13.6	0.035	27.65	0.007	41.7	0.001
13.62	0.035	27.67	0.009	41.72	0.001
13.63	0.035	27.68	0.006	41.73	0.001
13.65	0.035	27.7	0.008	41.75	0.001
13.67	0.035	27.72	0.01	41.77	0.001
13.68	0.035	27.73	0.008	41.78	0.001
13.7	0.034	27.75	0.007	41.8	0.001
13.72	0.035	27.77	0.009	41.82	0.
13.73	0.034	27.78	0.008	41.83	0.001
13.75	0.034	27.8	0.009	41.85	0.001
13.77	0.034	27.82	0.008	41.87	0.001
13.78	0.034	27.83	0.008	41.88	0.
13.8	0.034	27.85	0.008	41.9	0.001
13.82	0.034	27.87	0.008	41.92	0.001
13.83	0.034	27.88	0.008	41.93	0.001
13.85	0.034	27.9	0.008	41.95	0.001
13.87	0.034	27.92	0.008	41.97	0.001
13.88	0.034	27.93	0.008	41.98	0.001
13.9	0.034	27.95	0.008	42.	0.001
13.92	0.034	27.97	0.007	42.02	0.001
13.93	0.034	27.98	0.007	42.03	0.001
13.95	0.033	28.	0.007	42.05	0.001
13.97	0.033	28.02	0.008	42.07	0.001
13.98	0.034	28.03	0.008	42.08	0.001
14.	0.034	28.05	0.007	42.1	0.001
14.02	0.033	28.07	0.007	42.12	0.001
14.03	0.033	28.08	0.008	42.13	0.001
14.05	0.033	28.1	0.008	42.15	0.001
14.07	0.033	28.12	0.007	42.17	0.001
14.08	0.033	28.13	0.008	42.18	0.001
14.1	0.034	28.15	0.008	42.2	0.
14.12	0.033	28.17	0.008	42.22	0.001
14.13	0.033	28.18	0.007	42.23	0.001
14.15	0.033	28.2	0.007	42.25	0.001
14.17	0.033	28.22	0.008	42.27	0.001
14.18	0.032	28.23	0.008	42.28	0.001
14.2	0.032	28.25	0.007	42.3	0.001
14.22	0.033	28.27	0.008	42.32	0.001
14.23	0.033	28.28	0.007	42.33	0.
14.25	0.033	28.3	0.008	42.35	0.001
14.27	0.033	28.32	0.008	42.37	0.001
14.28	0.033	28.33	0.008	42.38	0.001
14.3	0.032	28.35	0.007	42.4	0.001
14.32	0.032	28.37	0.007	42.42	0.001
14.33	0.032	28.38	0.007	42.43	0.
14.35	0.033	28.4	0.008	42.45	0.
14.37	0.032	28.42	0.008	42.47	0.001
14.38	0.032	28.43	0.007	42.48	0.001
14.4	0.032	28.45	0.007	42.5	0.
14.42	0.032	28.47	0.007	42.52	0.
14.43	0.031	28.48	0.007	42.53	0.
14.45	0.031	28.5	0.007		
14.47	0.032	28.52	0.006		

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.005045	ft/min
y0	0.3025	ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	
K	0.005045	1.808E-05	ft/min
y0	0.3025	0.0008179	ft

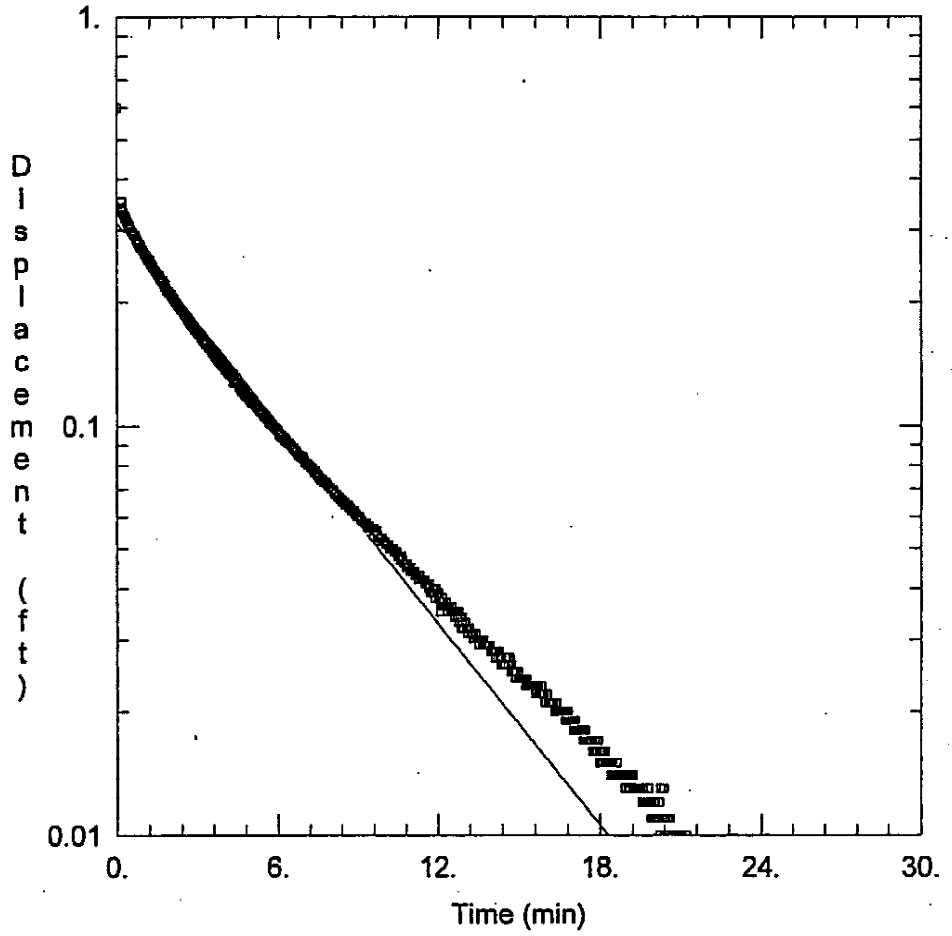
Parameter Correlations

	K	y0
K	1.00	0.76
y0	0.76	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1093 ft^2
Variance . . . . . 4.33E-05 ft^2
Std. Deviation . . . . . 0.006581 ft
Mean . . . . . 0.002775 ft
No. of Residuals . . . . . 2527.
No. of Estimates 2



W27 SLUG OUT

Data Set: F:\...\w27 slug out.aqt
Date: 04/29/05 Time: 07:13:53

PROJECT INFORMATION

Company: Providence Engineering
Client: BFI Colonial
Project: 018-005
Test Location: Colonial Landfill
Test Well: W27 Slug Out
Test Date: March 22, 2005

AQUIFER DATA

Saturated Thickness: 2. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W27 Slug Out)

Initial Displacement: 0.6 ft
Wellbore Radius: 0.333 ft
Screen Length: 5. ft
Casing Radius: 0.333 ft
Well Skin Radius: 0.333 ft
Total Well Penetration Depth: 17.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.005515 ft/min
y0 = 0.3136 ft

Data Set: F:\Projects\018 BFI\018 Projects\018-005\018-005 Work Folder\Task 16.0 Renewal Application\slug t
Title: W27 Slug out
Date: 04/29/05
Time: 07:13:59

PROJECT INFORMATION

Company: Providence Engineering
Client: BFI Colonial
Project: 018-005
Location: Colonial Landfill
Test Date: March 22, 2005
Test Well: W27 Slug Out

AQUIFER DATA

Saturated Thickness: 2. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Initial Displacement: 0.6 ft
Casing Radius: 0.333 ft
Wellbore Radius: 0.333 ft
Well Skin Radius: 0.333 ft
Screen Length: 5. ft
Total Well Penetration Depth: 17.25 ft
Gravel Pack Porosity: 0.

No. of observations: 1757

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1667	0.353	9.933	0.052	19.7	0.012
0.1833	0.341	9.95	0.052	19.72	0.012
0.2	0.337	9.967	0.052	19.73	0.012
0.2167	0.335	9.983	0.052	19.75	0.012
0.2333	0.333	10.	0.052	19.77	0.012
0.25	0.33	10.02	0.051	19.78	0.013
0.2667	0.328	10.03	0.051	19.8	0.012
0.2833	0.326	10.05	0.051	19.82	0.013
0.3	0.324	10.07	0.051	19.83	0.012
0.3167	0.322	10.08	0.051	19.85	0.012
0.3333	0.321	10.1	0.051	19.87	0.012
0.35	0.319	10.12	0.051	19.88	0.011
0.3667	0.317	10.13	0.051	19.9	0.012
0.3833	0.315	10.15	0.051	19.92	0.011
0.4	0.313	10.17	0.05	19.93	0.011
0.4167	0.312	10.18	0.05	19.95	0.012
0.4333	0.31	10.2	0.05	19.97	0.011
0.45	0.308	10.22	0.05	19.98	0.011
0.4667	0.307	10.23	0.05	20.	0.011
0.4833	0.306	10.25	0.05	20.02	0.011
0.5	0.304	10.27	0.05	20.03	0.012
0.5167	0.303	10.28	0.05	20.05	0.011
0.5333	0.301	10.3	0.05	20.07	0.011
0.55	0.299	10.32	0.05	20.08	0.011
0.5667	0.298	10.33	0.05	20.1	0.011
0.5833	0.297	10.35	0.049	20.12	0.011
0.6	0.295	10.37	0.049	20.13	0.011
0.6167	0.294	10.38	0.049	20.15	0.011
0.6333	0.292	10.4	0.049	20.17	0.011
0.65	0.291	10.42	0.049	20.18	0.012
0.6667	0.29	10.43	0.049	20.2	0.011

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.6833	0.288	10.45	0.049	20.22	0.012
0.7	0.286	10.47	0.049	20.23	0.01
0.7167	0.285	10.48	0.048	20.25	0.013
0.7333	0.284	10.5	0.048	20.27	0.013
0.75	0.283	10.52	0.048	20.28	0.013
0.7667	0.282	10.53	0.048	20.3	0.008
0.7833	0.28	10.55	0.048	20.32	0.011
0.8	0.279	10.57	0.047	20.33	0.011
0.8167	0.278	10.58	0.048	20.35	0.009
0.8333	0.277	10.6	0.048	20.37	0.013
0.85	0.276	10.62	0.048	20.38	0.011
0.8667	0.274	10.63	0.048	20.4	0.01
0.8833	0.273	10.65	0.047	20.42	0.011
0.9	0.272	10.67	0.047	20.43	0.008
0.9167	0.27	10.68	0.047	20.45	0.011
0.9333	0.27	10.7	0.046	20.47	0.01
0.95	0.268	10.72	0.046	20.48	0.01
0.9667	0.267	10.73	0.046	20.5	0.009
0.9833	0.266	10.75	0.046	20.52	0.009
1.	0.265	10.77	0.046	20.53	0.011
1.017	0.264	10.78	0.046	20.55	0.009
1.033	0.263	10.8	0.046	20.57	0.011
1.05	0.262	10.82	0.045	20.58	0.008
1.067	0.261	10.83	0.046	20.6	0.01
1.083	0.259	10.85	0.046	20.62	0.011
1.1	0.259	10.87	0.045	20.63	0.009
1.117	0.257	10.88	0.045	20.65	0.009
1.133	0.256	10.9	0.045	20.67	0.008
1.15	0.255	10.92	0.045	20.68	0.01
1.167	0.254	10.93	0.045	20.7	0.01
1.183	0.253	10.95	0.044	20.72	0.009
1.2	0.253	10.97	0.045	20.73	0.01
1.217	0.252	10.98	0.044	20.75	0.01
1.233	0.25	11.	0.044	20.77	0.009
1.25	0.249	11.02	0.044	20.78	0.01
1.267	0.248	11.03	0.044	20.8	0.01
1.283	0.247	11.05	0.044	20.82	0.009
1.3	0.246	11.07	0.044	20.83	0.01
1.317	0.245	11.08	0.044	20.85	0.01
1.333	0.244	11.1	0.044	20.87	0.009
1.35	0.242	11.12	0.043	20.88	0.01
1.367	0.241	11.13	0.044	20.9	0.009
1.383	0.241	11.15	0.043	20.92	0.01
1.4	0.239	11.17	0.043	20.93	0.009
1.417	0.239	11.18	0.043	20.95	0.01
1.433	0.238	11.2	0.043	20.97	0.009
1.45	0.237	11.22	0.043	20.98	0.009
1.467	0.236	11.23	0.043	21.	0.009
1.483	0.235	11.25	0.042	21.02	0.009
1.5	0.234	11.27	0.043	21.03	0.01
1.517	0.233	11.28	0.043	21.05	0.009
1.533	0.232	11.3	0.043	21.07	0.009
1.55	0.232	11.32	0.043	21.08	0.009
1.567	0.23	11.33	0.042	21.1	0.009
1.583	0.229	11.35	0.042	21.12	0.009
1.6	0.228	11.37	0.042	21.13	0.009
1.617	0.228	11.38	0.042	21.15	0.009
1.633	0.227	11.4	0.042	21.17	0.009
1.65	0.226	11.42	0.042	21.18	0.009
1.667	0.225	11.43	0.042	21.2	0.01
1.683	0.226	11.45	0.042	21.22	0.009
1.7	0.225	11.47	0.042	21.23	0.01
1.717	0.222	11.48	0.042	21.25	0.009

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.733	0.223	11.5	0.042	21.27	0.009
1.75	0.222	11.52	0.041	21.28	0.009
1.767	0.22	11.53	0.041	21.3	0.009
1.783	0.218	11.55	0.041	21.32	0.009
1.8	0.221	11.57	0.041	21.33	0.009
1.817	0.214	11.58	0.041	21.35	0.009
1.833	0.215	11.6	0.041	21.37	0.009
1.85	0.215	11.62	0.041	21.38	0.009
1.867	0.214	11.63	0.04	21.4	0.009
1.883	0.213	11.65	0.041	21.42	0.009
1.9	0.213	11.67	0.041	21.43	0.009
1.917	0.211	11.68	0.04	21.45	0.009
1.933	0.212	11.7	0.04	21.47	0.009
1.95	0.211	11.72	0.039	21.48	0.008
1.967	0.21	11.73	0.039	21.5	0.009
1.983	0.209	11.75	0.039	21.52	0.009
2.	0.21	11.77	0.04	21.53	0.009
2.017	0.208	11.78	0.039	21.55	0.009
2.033	0.207	11.8	0.04	21.57	0.008
2.05	0.206	11.82	0.039	21.58	0.009
2.067	0.206	11.83	0.04	21.6	0.008
2.083	0.204	11.85	0.039	21.62	0.009
2.1	0.204	11.87	0.038	21.63	0.009
2.117	0.203	11.88	0.04	21.65	0.009
2.133	0.203	11.9	0.04	21.67	0.009
2.15	0.201	11.92	0.04	21.68	0.008
2.167	0.2	11.93	0.039	21.7	0.009
2.183	0.2	11.95	0.039	21.72	0.009
2.2	0.199	11.97	0.039	21.73	0.008
2.217	0.198	11.98	0.039	21.75	0.009
2.233	0.198	12.	0.039	21.77	0.009
2.25	0.197	12.02	0.038	21.78	0.009
2.267	0.196	12.03	0.039	21.8	0.008
2.283	0.196	12.05	0.038	21.82	0.009
2.3	0.195	12.07	0.037	21.83	0.009
2.317	0.194	12.08	0.035	21.85	0.008
2.333	0.193	12.1	0.036	21.87	0.008
2.35	0.193	12.12	0.037	21.88	0.008
2.367	0.192	12.13	0.036	21.9	0.008
2.383	0.191	12.15	0.038	21.92	0.008
2.4	0.191	12.17	0.036	21.93	0.008
2.417	0.191	12.18	0.037	21.95	0.008
2.433	0.19	12.2	0.036	21.97	0.008
2.45	0.189	12.22	0.037	21.98	0.008
2.467	0.189	12.23	0.037	22.	0.008
2.483	0.188	12.25	0.036	22.02	0.008
2.5	0.187	12.27	0.036	22.03	0.008
2.517	0.186	12.28	0.036	22.05	0.008
2.533	0.186	12.3	0.037	22.07	0.008
2.55	0.185	12.32	0.036	22.08	0.008
2.567	0.185	12.33	0.035	22.1	0.008
2.583	0.184	12.35	0.036	22.12	0.008
2.6	0.183	12.37	0.036	22.13	0.008
2.617	0.183	12.38	0.036	22.15	0.008
2.633	0.182	12.4	0.036	22.17	0.008
2.65	0.181	12.42	0.036	22.18	0.007
2.667	0.18	12.43	0.036	22.2	0.008
2.683	0.18	12.45	0.035	22.22	0.008
2.7	0.179	12.47	0.035	22.23	0.008
2.717	0.178	12.48	0.035	22.25	0.007
2.733	0.178	12.5	0.036	22.27	0.008
2.75	0.177	12.52	0.035	22.28	0.008
2.767	0.177	12.53	0.035	22.3	0.007

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.783	0.176	12.55	0.035	22.32	0.007
2.8	0.175	12.57	0.035	22.33	0.008
2.817	0.175	12.58	0.035	22.35	0.008
2.833	0.174	12.6	0.035	22.37	0.008
2.85	0.174	12.62	0.034	22.38	0.008
2.867	0.174	12.63	0.035	22.4	0.007
2.883	0.172	12.65	0.035	22.42	0.008
2.9	0.173	12.67	0.035	22.43	0.008
2.917	0.171	12.68	0.035	22.45	0.007
2.933	0.171	12.7	0.034	22.47	0.008
2.95	0.17	12.72	0.035	22.48	0.008
2.967	0.17	12.73	0.034	22.5	0.008
2.983	0.169	12.75	0.034	22.52	0.007
3.	0.168	12.77	0.035	22.53	0.008
3.017	0.168	12.78	0.033	22.55	0.007
3.033	0.167	12.8	0.034	22.57	0.008
3.05	0.167	12.82	0.033	22.58	0.008
3.067	0.167	12.83	0.034	22.6	0.007
3.083	0.166	12.85	0.034	22.62	0.007
3.1	0.165	12.87	0.032	22.63	0.008
3.117	0.165	12.88	0.033	22.65	0.007
3.133	0.164	12.9	0.034	22.67	0.008
3.15	0.164	12.92	0.032	22.68	0.008
3.167	0.163	12.93	0.033	22.7	0.007
3.183	0.162	12.95	0.032	22.72	0.008
3.2	0.162	12.97	0.032	22.73	0.007
3.217	0.161	12.98	0.032	22.75	0.008
3.233	0.161	13.	0.033	22.77	0.008
3.25	0.16	13.02	0.033	22.78	0.008
3.267	0.16	13.03	0.033	22.8	0.008
3.283	0.159	13.05	0.032	22.82	0.007
3.3	0.159	13.07	0.032	22.83	0.008
3.317	0.158	13.08	0.031	22.85	0.008
3.333	0.158	13.1	0.031	22.87	0.007
3.35	0.157	13.12	0.032	22.88	0.007
3.367	0.156	13.13	0.031	22.9	0.007
3.383	0.156	13.15	0.032	22.92	0.007
3.4	0.156	13.17	0.032	22.93	0.008
3.417	0.155	13.18	0.031	22.95	0.007
3.433	0.155	13.2	0.031	22.97	0.007
3.45	0.154	13.22	0.031	22.98	0.007
3.467	0.154	13.23	0.031	23.	0.007
3.483	0.153	13.25	0.031	23.02	0.007
3.5	0.153	13.27	0.031	23.03	0.007
3.517	0.152	13.28	0.031	23.05	0.007
3.533	0.151	13.3	0.031	23.07	0.007
3.55	0.151	13.32	0.031	23.08	0.007
3.567	0.15	13.33	0.03	23.1	0.007
3.583	0.15	13.35	0.03	23.12	0.007
3.6	0.15	13.37	0.03	23.13	0.007
3.617	0.149	13.38	0.031	23.15	0.007
3.633	0.149	13.4	0.031	23.17	0.006
3.65	0.148	13.42	0.03	23.18	0.007
3.667	0.148	13.43	0.03	23.2	0.007
3.683	0.147	13.45	0.03	23.22	0.007
3.7	0.147	13.47	0.03	23.23	0.007
3.717	0.147	13.48	0.03	23.25	0.006
3.733	0.146	13.5	0.03	23.27	0.007
3.75	0.145	13.52	0.03	23.28	0.007
3.767	0.144	13.53	0.029	23.3	0.007
3.783	0.145	13.55	0.03	23.32	0.007
3.8	0.144	13.57	0.03	23.33	0.007
3.817	0.143	13.58	0.03	23.35	0.007

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.833	0.143	13.6	0.03	23.37	0.007
3.85	0.142	13.62	0.03	23.38	0.007
3.867	0.142	13.63	0.03	23.4	0.007
3.883	0.142	13.65	0.029	23.42	0.006
3.9	0.141	13.67	0.03	23.43	0.006
3.917	0.141	13.68	0.03	23.45	0.006
3.933	0.14	13.7	0.03	23.47	0.007
3.95	0.14	13.72	0.029	23.48	0.007
3.967	0.14	13.73	0.029	23.5	0.007
3.983	0.139	13.75	0.029	23.52	0.007
4.	0.139	13.77	0.029	23.53	0.007
4.017	0.137	13.78	0.029	23.55	0.006
4.033	0.138	13.8	0.029	23.57	0.007
4.05	0.137	13.82	0.029	23.58	0.006
4.067	0.136	13.83	0.029	23.6	0.006
4.083	0.137	13.85	0.029	23.62	0.007
4.1	0.136	13.87	0.029	23.63	0.006
4.117	0.135	13.88	0.029	23.65	0.006
4.133	0.135	13.9	0.029	23.67	0.006
4.15	0.134	13.92	0.029	23.68	0.007
4.167	0.134	13.93	0.029	23.7	0.006
4.183	0.134	13.95	0.028	23.72	0.006
4.2	0.134	13.97	0.028	23.73	0.006
4.217	0.133	13.98	0.028	23.75	0.007
4.233	0.134	14.	0.028	23.77	0.006
4.25	0.133	14.02	0.028	23.78	0.007
4.267	0.134	14.03	0.028	23.8	0.007
4.283	0.132	14.05	0.028	23.82	0.006
4.3	0.134	14.07	0.028	23.83	0.007
4.317	0.128	14.08	0.028	23.85	0.006
4.333	0.128	14.1	0.028	23.87	0.006
4.35	0.13	14.12	0.028	23.88	0.006
4.367	0.128	14.13	0.027	23.9	0.006
4.383	0.127	14.15	0.028	23.92	0.006
4.4	0.128	14.17	0.028	23.93	0.006
4.417	0.128	14.18	0.028	23.95	0.006
4.433	0.127	14.2	0.027	23.97	0.006
4.45	0.127	14.22	0.027	23.98	0.007
4.467	0.128	14.23	0.028	24.	0.004
4.483	0.128	14.25	0.028	24.02	0.006
4.5	0.128	14.27	0.028	24.03	0.006
4.517	0.127	14.28	0.027	24.05	0.007
4.533	0.124	14.3	0.027	24.07	0.004
4.55	0.125	14.32	0.027	24.08	0.004
4.567	0.125	14.33	0.026	24.1	0.007
4.583	0.126	14.35	0.027	24.12	0.006
4.6	0.122	14.37	0.027	24.13	0.004
4.617	0.123	14.38	0.026	24.15	0.008
4.633	0.122	14.4	0.026	24.17	0.007
4.65	0.121	14.42	0.026	24.18	0.008
4.667	0.121	14.43	0.026	24.2	0.006
4.683	0.122	14.45	0.026	24.22	0.004
4.7	0.121	14.47	0.026	24.23	0.004
4.717	0.122	14.48	0.026	24.25	0.006
4.733	0.12	14.5	0.027	24.27	0.005
4.75	0.12	14.52	0.026	24.28	0.005
4.767	0.119	14.53	0.026	24.3	0.005
4.783	0.12	14.55	0.027	24.32	0.005
4.8	0.119	14.57	0.026	24.33	0.005
4.817	0.119	14.58	0.027	24.35	0.004
4.833	0.118	14.6	0.026	24.37	0.005
4.85	0.118	14.62	0.026	24.38	0.005
4.867	0.118	14.63	0.026	24.4	0.005

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
4.883	0.118	14.65	0.027	24.42	0.005
4.9	0.117	14.67	0.026	24.43	0.005
4.917	0.116	14.68	0.026	24.45	0.005
4.933	0.116	14.7	0.025	24.47	0.005
4.95	0.116	14.72	0.026	24.48	0.005
4.967	0.116	14.73	0.026	24.5	0.005
4.983	0.115	14.75	0.025	24.52	0.005
5.	0.115	14.77	0.025	24.53	0.005
5.017	0.114	14.78	0.025	24.55	0.004
5.033	0.114	14.8	0.025	24.57	0.005
5.05	0.114	14.82	0.025	24.58	0.004
5.067	0.114	14.83	0.025	24.6	0.005
5.083	0.114	14.85	0.025	24.62	0.005
5.1	0.113	14.87	0.024	24.63	0.005
5.117	0.113	14.88	0.025	24.65	0.004
5.133	0.113	14.9	0.025	24.67	0.005
5.15	0.112	14.92	0.025	24.68	0.004
5.167	0.112	14.93	0.025	24.7	0.005
5.183	0.111	14.95	0.024	24.72	0.004
5.2	0.111	14.97	0.024	24.73	0.005
5.217	0.111	14.98	0.025	24.75	0.004
5.233	0.111	15.	0.024	24.77	0.005
5.25	0.11	15.02	0.024	24.78	0.004
5.267	0.11	15.03	0.024	24.8	0.005
5.283	0.109	15.05	0.024	24.82	0.004
5.3	0.109	15.07	0.024	24.83	0.004
5.317	0.109	15.08	0.024	24.85	0.004
5.333	0.108	15.1	0.024	24.87	0.005
5.35	0.108	15.12	0.024	24.88	0.004
5.367	0.108	15.13	0.024	24.9	0.006
5.383	0.108	15.15	0.024	24.92	0.005
5.4	0.107	15.17	0.024	24.93	0.004
5.417	0.107	15.18	0.024	24.95	0.005
5.433	0.107	15.2	0.024	24.97	0.004
5.45	0.106	15.22	0.024	24.98	0.005
5.467	0.106	15.23	0.024	25.	0.005
5.483	0.105	15.25	0.023	25.02	0.004
5.5	0.105	15.27	0.024	25.03	0.004
5.517	0.105	15.28	0.023	25.05	0.005
5.533	0.105	15.3	0.023	25.07	0.004
5.55	0.105	15.32	0.023	25.08	0.005
5.567	0.104	15.33	0.023	25.1	0.004
5.583	0.104	15.35	0.023	25.12	0.004
5.6	0.104	15.37	0.023	25.13	0.005
5.617	0.103	15.38	0.023	25.15	0.005
5.633	0.103	15.4	0.023	25.17	0.004
5.65	0.102	15.42	0.023	25.18	0.004
5.667	0.103	15.43	0.023	25.2	0.004
5.683	0.102	15.45	0.023	25.22	0.004
5.7	0.102	15.47	0.023	25.23	0.004
5.717	0.102	15.48	0.023	25.25	0.004
5.733	0.101	15.5	0.023	25.27	0.004
5.75	0.101	15.52	0.023	25.28	0.004
5.767	0.101	15.53	0.023	25.3	0.004
5.783	0.101	15.55	0.023	25.32	0.004
5.8	0.1	15.57	0.023	25.33	0.004
5.817	0.1	15.58	0.023	25.35	0.004
5.833	0.1	15.6	0.023	25.37	0.004
5.85	0.099	15.62	0.022	25.38	0.004
5.867	0.099	15.63	0.023	25.4	0.004
5.883	0.099	15.65	0.023	25.42	0.004
5.9	0.099	15.67	0.022	25.43	0.004
5.917	0.098	15.68	0.023	25.45	0.004

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.933	0.098	15.7	0.023	25.47	0.004
5.95	0.098	15.72	0.022	25.48	0.004
5.967	0.098	15.73	0.022	25.5	0.004
5.983	0.098	15.75	0.022	25.52	0.004
6.	0.097	15.77	0.022	25.53	0.004
6.017	0.097	15.78	0.022	25.55	0.004
6.033	0.096	15.8	0.022	25.57	0.004
6.05	0.095	15.82	0.022	25.58	0.004
6.067	0.095	15.83	0.023	25.6	0.004
6.083	0.095	15.85	0.022	25.62	0.004
6.1	0.095	15.87	0.022	25.63	0.004
6.117	0.094	15.88	0.022	25.65	0.004
6.133	0.095	15.9	0.022	25.67	0.004
6.15	0.094	15.92	0.022	25.68	0.004
6.167	0.094	15.93	0.022	25.7	0.004
6.183	0.094	15.95	0.021	25.72	0.004
6.2	0.093	15.97	0.021	25.73	0.003
6.217	0.094	15.98	0.021	25.75	0.003
6.233	0.093	16.	0.022	25.77	0.004
6.25	0.093	16.02	0.022	25.78	0.004
6.267	0.092	16.03	0.022	25.8	0.003
6.283	0.093	16.05	0.022	25.82	0.004
6.3	0.092	16.07	0.021	25.83	0.003
6.317	0.092	16.08	0.021	25.85	0.003
6.333	0.092	16.1	0.021	25.87	0.003
6.35	0.091	16.12	0.021	25.88	0.004
6.367	0.091	16.13	0.021	25.9	0.004
6.383	0.091	16.15	0.021	25.92	0.003
6.4	0.091	16.17	0.021	25.93	0.003
6.417	0.091	16.18	0.021	25.95	0.003
6.433	0.09	16.2	0.021	25.97	0.003
6.45	0.09	16.22	0.021	25.98	0.004
6.467	0.09	16.23	0.021	26.	0.003
6.483	0.09	16.25	0.021	26.02	0.003
6.5	0.089	16.27	0.021	26.03	0.004
6.517	0.089	16.28	0.021	26.05	0.003
6.533	0.089	16.3	0.021	26.07	0.003
6.55	0.088	16.32	0.02	26.08	0.003
6.567	0.088	16.33	0.02	26.1	0.004
6.583	0.089	16.35	0.021	26.12	0.004
6.6	0.088	16.37	0.02	26.13	0.003
6.617	0.087	16.38	0.021	26.15	0.003
6.633	0.087	16.4	0.02	26.17	0.004
6.65	0.087	16.42	0.02	26.18	0.004
6.667	0.087	16.43	0.02	26.2	0.003
6.683	0.086	16.45	0.02	26.22	0.003
6.7	0.086	16.47	0.02	26.23	0.003
6.717	0.086	16.48	0.02	26.25	0.003
6.733	0.085	16.5	0.02	26.27	0.003
6.75	0.085	16.52	0.02	26.28	0.003
6.767	0.085	16.53	0.02	26.3	0.003
6.783	0.085	16.55	0.02	26.32	0.003
6.8	0.085	16.57	0.02	26.33	0.003
6.817	0.084	16.58	0.02	26.35	0.003
6.833	0.084	16.6	0.02	26.37	0.003
6.85	0.084	16.62	0.02	26.38	0.003
6.867	0.084	16.63	0.02	26.4	0.003
6.883	0.084	16.65	0.02	26.42	0.003
6.9	0.083	16.67	0.02	26.43	0.003
6.917	0.084	16.68	0.02	26.45	0.003
6.933	0.083	16.7	0.02	26.47	0.003
6.95	0.083	16.72	0.019	26.48	0.003
6.967	0.083	16.73	0.02	26.5	0.003

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
6.983	0.082	16.75	0.02	26.52	0.003
7.	0.082	16.77	0.019	26.53	0.003
7.017	0.081	16.78	0.02	26.55	0.003
7.033	0.081	16.8	0.019	26.57	0.003
7.05	0.081	16.82	0.019	26.58	0.003
7.067	0.081	16.83	0.02	26.6	0.002
7.083	0.081	16.85	0.019	26.62	0.003
7.1	0.081	16.87	0.019	26.63	0.002
7.117	0.08	16.88	0.019	26.65	0.003
7.133	0.08	16.9	0.019	26.67	0.003
7.15	0.08	16.92	0.019	26.68	0.003
7.167	0.08	16.93	0.019	26.7	0.003
7.183	0.08	16.95	0.019	26.72	0.003
7.2	0.079	16.97	0.019	26.73	0.003
7.217	0.079	16.98	0.019	26.75	0.003
7.233	0.079	17.	0.018	26.77	0.003
7.25	0.079	17.02	0.018	26.78	0.003
7.267	0.079	17.03	0.019	26.8	0.003
7.283	0.079	17.05	0.019	26.82	0.002
7.3	0.078	17.07	0.019	26.83	0.003
7.317	0.078	17.08	0.018	26.85	0.003
7.333	0.078	17.1	0.018	26.87	0.003
7.35	0.077	17.12	0.018	26.88	0.003
7.367	0.077	17.13	0.018	26.9	0.003
7.383	0.078	17.15	0.018	26.92	0.003
7.4	0.077	17.17	0.018	26.93	0.003
7.417	0.077	17.18	0.018	26.95	0.002
7.433	0.077	17.2	0.018	26.97	0.002
7.45	0.076	17.22	0.018	26.98	0.003
7.467	0.076	17.23	0.018	27.	0.003
7.483	0.076	17.25	0.018	27.02	0.002
7.5	0.076	17.27	0.018	27.03	0.002
7.517	0.075	17.28	0.018	27.05	0.003
7.533	0.075	17.3	0.018	27.07	0.003
7.55	0.075	17.32	0.018	27.08	0.003
7.567	0.075	17.33	0.018	27.1	0.003
7.583	0.074	17.35	0.018	27.12	0.003
7.6	0.074	17.37	0.018	27.13	0.003
7.617	0.074	17.38	0.017	27.15	0.002
7.633	0.074	17.4	0.017	27.17	0.002
7.65	0.074	17.42	0.017	27.18	0.002
7.667	0.074	17.43	0.018	27.2	0.002
7.683	0.073	17.45	0.018	27.22	0.002
7.7	0.073	17.47	0.017	27.23	0.002
7.717	0.073	17.48	0.017	27.25	0.002
7.733	0.073	17.5	0.017	27.27	0.003
7.75	0.073	17.52	0.017	27.28	0.002
7.767	0.073	17.53	0.017	27.3	0.003
7.783	0.073	17.55	0.017	27.32	0.002
7.8	0.073	17.57	0.017	27.33	0.002
7.817	0.072	17.58	0.017	27.35	0.003
7.833	0.072	17.6	0.017	27.37	0.002
7.85	0.072	17.62	0.017	27.38	0.002
7.867	0.072	17.63	0.017	27.4	0.002
7.883	0.071	17.65	0.017	27.42	0.002
7.9	0.071	17.67	0.017	27.43	0.002
7.917	0.071	17.68	0.017	27.45	0.002
7.933	0.071	17.7	0.017	27.47	0.002
7.95	0.071	17.72	0.017	27.48	0.002
7.967	0.07	17.73	0.016	27.5	0.003
7.983	0.07	17.75	0.016	27.52	0.002
8.	0.07	17.77	0.016	27.53	0.002
8.017	0.07	17.78	0.016	27.55	0.002

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
8.033	0.07	17.8	0.017	27.57	0.002
8.05	0.07	17.82	0.017	27.58	0.002
8.067	0.07	17.83	0.016	27.6	0.002
8.083	0.069	17.85	0.016	27.62	0.002
8.1	0.069	17.87	0.016	27.63	0.002
8.117	0.069	17.88	0.016	27.65	0.002
8.133	0.068	17.9	0.016	27.67	0.002
8.15	0.068	17.92	0.017	27.68	0.002
8.167	0.068	17.93	0.017	27.7	0.002
8.183	0.068	17.95	0.016	27.72	0.002
8.2	0.068	17.97	0.015	27.73	0.002
8.217	0.067	17.98	0.016	27.75	0.002
8.233	0.067	18.	0.016	27.77	0.002
8.25	0.067	18.02	0.015	27.78	0.002
8.267	0.067	18.03	0.016	27.8	0.002
8.283	0.067	18.05	0.016	27.82	0.002
8.3	0.067	18.07	0.015	27.83	0.002
8.317	0.067	18.08	0.016	27.85	0.002
8.333	0.066	18.1	0.015	27.87	0.002
8.35	0.066	18.12	0.016	27.88	0.002
8.367	0.066	18.13	0.016	27.9	0.002
8.383	0.066	18.15	0.015	27.92	0.003
8.4	0.066	18.17	0.015	27.93	0.003
8.417	0.066	18.18	0.016	27.95	0.003
8.433	0.065	18.2	0.015	27.97	0.002
8.45	0.065	18.22	0.015	27.98	0.002
8.467	0.065	18.23	0.015	28.	0.002
8.483	0.065	18.25	0.015	28.02	0.003
8.5	0.065	18.27	0.015	28.03	0.002
8.517	0.065	18.28	0.015	28.05	0.003
8.533	0.064	18.3	0.015	28.07	0.002
8.55	0.064	18.32	0.015	28.08	0.002
8.567	0.064	18.33	0.015	28.1	0.002
8.583	0.064	18.35	0.015	28.12	0.002
8.6	0.064	18.37	0.015	28.13	0.002
8.617	0.064	18.38	0.015	28.15	0.002
8.633	0.064	18.4	0.015	28.17	0.002
8.65	0.064	18.42	0.014	28.18	0.002
8.667	0.063	18.43	0.015	28.2	0.002
8.683	0.063	18.45	0.015	28.22	0.002
8.7	0.063	18.47	0.014	28.23	0.002
8.717	0.063	18.48	0.014	28.25	0.002
8.733	0.063	18.5	0.014	28.27	0.001
8.75	0.062	18.52	0.014	28.28	0.002
8.767	0.062	18.53	0.014	28.3	0.002
8.783	0.062	18.55	0.014	28.32	0.002
8.8	0.062	18.57	0.014	28.33	0.002
8.817	0.062	18.58	0.014	28.35	0.002
8.833	0.062	18.6	0.014	28.37	0.002
8.85	0.062	18.62	0.015	28.38	0.002
8.867	0.062	18.63	0.014	28.4	0.002
8.883	0.061	18.65	0.014	28.42	0.001
8.9	0.061	18.67	0.014	28.43	0.002
8.917	0.061	18.68	0.014	28.45	0.002
8.933	0.061	18.7	0.014	28.47	0.002
8.95	0.06	18.72	0.014	28.48	0.001
8.967	0.06	18.73	0.014	28.5	0.002
8.983	0.06	18.75	0.014	28.52	0.002
9.	0.06	18.77	0.014	28.53	0.002
9.017	0.06	18.78	0.014	28.55	0.002
9.033	0.06	18.8	0.014	28.57	0.002
9.05	0.06	18.82	0.014	28.58	0.002
9.067	0.06	18.83	0.014	28.6	0.002

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
9.083	0.059	18.85	0.014	28.62	0.002
9.1	0.059	18.87	0.014	28.63	0.002
9.117	0.059	18.88	0.014	28.65	0.002
9.133	0.059	18.9	0.014	28.67	0.002
9.15	0.059	18.92	0.014	28.68	0.001
9.167	0.058	18.93	0.013	28.7	0.002
9.183	0.058	18.95	0.014	28.72	0.002
9.2	0.058	18.97	0.014	28.73	0.002
9.217	0.058	18.98	0.014	28.75	0.002
9.233	0.058	19.	0.014	28.77	0.003
9.25	0.058	19.02	0.014	28.78	0.002
9.267	0.058	19.03	0.013	28.8	0.001
9.283	0.058	19.05	0.014	28.82	0.002
9.3	0.057	19.07	0.013	28.83	0.002
9.317	0.057	19.08	0.014	28.85	0.002
9.333	0.058	19.1	0.014	28.87	0.001
9.35	0.057	19.12	0.013	28.88	0.001
9.367	0.057	19.13	0.013	28.9	0.001
9.383	0.057	19.15	0.014	28.92	0.001
9.4	0.057	19.17	0.013	28.93	0.002
9.417	0.057	19.18	0.013	28.95	0.002
9.433	0.056	19.2	0.014	28.97	0.001
9.45	0.056	19.22	0.014	28.98	0.001
9.467	0.056	19.23	0.013	29.	0.001
9.483	0.056	19.25	0.013	29.02	0.001
9.5	0.056	19.27	0.013	29.03	0.001
9.517	0.056	19.28	0.013	29.05	0.001
9.533	0.056	19.3	0.013	29.07	0.001
9.55	0.056	19.32	0.013	29.08	0.001
9.567	0.056	19.33	0.013	29.1	0.001
9.583	0.055	19.35	0.013	29.12	0.001
9.6	0.055	19.37	0.013	29.13	0.001
9.617	0.055	19.38	0.013	29.15	0.001
9.633	0.055	19.4	0.013	29.17	0.001
9.65	0.055	19.42	0.013	29.18	0.001
9.667	0.055	19.43	0.013	29.2	0.001
9.683	0.055	19.45	0.013	29.22	0.001
9.7	0.055	19.47	0.013	29.23	0.001
9.717	0.053	19.48	0.013	29.25	0.001
9.733	0.054	19.5	0.013	29.27	0.
9.75	0.053	19.52	0.013	29.28	0.001
9.767	0.053	19.53	0.013	29.3	0.001
9.783	0.053	19.55	0.012	29.32	0.
9.8	0.053	19.57	0.013	29.33	0.001
9.817	0.053	19.58	0.012	29.35	0.001
9.833	0.053	19.6	0.012	29.37	0.
9.85	0.052	19.62	0.013	29.38	0.
9.867	0.053	19.63	0.012	29.4	0.
9.883	0.053	19.65	0.012	29.42	0.001
9.9	0.053	19.67	0.012	29.43	0.
9.917	0.052	19.68	0.012		

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.005515	ft/min

y0	0.3136	ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	
K	0.005515	1.705E-05	ft/min
y0	0.3136	0.0007007	ft

Parameter Correlations

	K	y0
K	1.00	0.73
y0	0.73	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.06056 ft^2
Variance . . . . . 3.451E-05 ft^2
Std. Deviation . . . . . 0.005874 ft
Mean . . . . . 0.001797 ft
No. of Residuals . . . . . 1757.
No. of Estimates 2

APPENDIX Q

CERTIFICATION STATEMENT

CERTIFICATION STATEMENT

Facility Name: BFI Waste Systems of Louisiana, LLC
Colonial Landfill

Project Description: Solid Waste Permit Renewal Application
Type I and II Landfill

"I certify under penalty of law that I have personally examined and I am familiar with the information submitted in this permit application (mandatory modification document) and that the facility as described in this permit application meets the requirements of the Solid Waste Rules and Regulations. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment."

STATE OF LOUISIANA
TODD A. BLACK
REG. No. 27127
REGISTERED
PROFESSIONAL
ENGINEER
IN
CIVIL ENGINEERING

Todd A. Black, P.E.
Providence Engineering

6/19/07
Date

APPENDIX R

SOIL CALCULATIONS

Providence Engineering and Environmental Group LLC
BATON ROUGE, LOUISIANA

JOB NO.	018-005		
BY	DMM	DATE	3/8/2007
CHECKED		DATE	
PAGE	1 of 1	REV.	0

CALCULATIONS AND SKETCHES

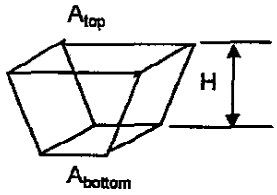
CLIENT BFI Waste Systems of North America, Inc. - Colonial Landfill
DESCRIPTION Phase III Soil Balance

Purpose: Develop a soil balance for Phase III of the Colonial landfill

Soil Balance

Excavated Soils => Required Soils (perimeter berm, clay liner, and final cap)
(note: Colonial Landfill uses approved off-site materials for daily and interim cover and are not included in the requried soils volume calculations.)

1) Determine Phase III Excavated Soils Volume



Phase III surface area at existing grade =	3,059,000	ft^2
Existing grade elevation =	1.8	ft
Phase III bottom surface area =	2,539,000	ft^2
maximum excavation depth =	-3	ft
minimum excavation depth =	-12	ft
average excavation depth =	-7.5	ft

$V_{excavated} = H * (A_{top} + A_{bottom}) / 2$

H = existing grade elevation - average excavation depth = 9.3 ft

$V_{excavated}$ = 26,030,700 ft^3 = 964,100 yd^3

2) Determine Phase III Required Soils Volume

Perimeter Berm

Length of perimter road =	6,350	ft
Existing grade elevation =	1.8	ft
Access road top elevation =	8	ft
Access road side slopes =	33.3%	
Access Road top width =	20	ft
Bottom width of access road =	57.2	ft

$V_{perimeter\_berm} = L * H * (W_{top} + W_{bottom}) / 2$

$V_{perimeter\_berm}$ = 1,519,682 ft^3 = 56,285 yd^3

Providence Engineering and Environmental Group LLC
BATON ROUGE, LOUISIANA

CALCULATIONS AND SKETCHES

JOB NO.	018-005		
BY	DMM	**DATE**	3/8/2007
CHECKED		**DATE**	
PAGE	1 of 1	**REV.**	0

CLIENT BFI Waste Systems of North America, Inc. - Colonial Landfill
DESCRIPTION Phase III Soil Balance

2) Determine Phase III Required Soils Volume (cont'd)

Clay liner

Phase III surface area at existing grade = 3,059,000 ft^2
Clay liner thickness = 3 ft

V_{clay_liner} = Atop * Clay thickness * 1.05
(typical estimation of clay volume using sideslopes)

V_{clay_liner} = 9,635,850 ft^3 = 356,883 yd^3

Final Cover

Phase III final cover surface area = 3,876,840 ft^2
Final cap thickness = 2.5 ft

$V_{cap\_material}$ = Area * Clay thickness = 9,692,100 ft^3

$V_{cap\_material}$ = 9,692,100 ft^3 = 358,967 yd^3

3) Determine Soil Balance

Excavated Soils Volume = 964,100 yd^3
Required Soils Volume = 772,135 yd^3

Excavated Soils Volume >= Required Soils Volume, Okay

APPENDIX S

DAILY COVER OPERATIONS PROCEDURE (HYDROMULCH SYNTHETIC COVER)

HYDROMULCH SYNTHETIC DAILY COVER
OPERATIONS PROCEDURE
COLONIAL LANDFILL

Hydromulch synthetic daily cover may be used in order to provide daily cover at the Colonial Landfill in lieu of soil cover or other approved alternate daily cover. The use of hydromulch cover shall achieve the purposes of daily cover as specified in LAC 33:VII.711.B.2 to minimize fire hazards, odors, blowing litter, vector food and harborage, and infiltration of precipitation; discourage scavenging; limit erosion; and provide an aesthetic appearance. Exclusive use of hydromulch daily cover is not intended since site and weather conditions will dictate continuing intermittent reliance on soil and portable synthetic covers. Hydromulch cover is intended to be used only when site and weather conditions are appropriate in order to conserve on consumption of site cover soil sources, increase efficiency of site volume consumption, and lengthen facility life.

1. Management of Waste Placement

Waste placement and compaction will be complete prior to applying hydromulch cover.

Compactive effort shall be extended throughout the working day to achieve a relatively smooth, highly compacted surface with little or no observable rebound following passage of the compaction equipment.

Waste placement shall be continuously monitored throughout the working day to assure that bulky, irregular, and relatively incompactible waste materials are placed within the bottom lifts of the daily work cell and not within the top lifts. The surface area of the daily placement cell shall be constructed of selected household wastes or industrial wastes that can be tightly compacted to present a relatively smooth, uniform surface for application of hydromulch cover.

Certain wastes that are particularly odoriferous or attractive to vermin shall be placed within the bottom lifts of the daily waste cell and not left near the surface of the cell to be covered only with hydromulch cover. These types of waste include dead animals, food waste and undigested sewage sludge. A conventional soil cover shall be used to cover such wastes unless the wastes can be well covered with typical household wastes prior to application of the hydromulch.

2. Personnel Training

The facility operators shall be familiar with the Material Safety Data Sheet information for all hydromulch materials. Training on the use of the hydromulch material and operation of the hydroseeder to apply the material will be provided by the equipment manufacturer and/or the hydromulch material supplier.

3. Mixing Procedure

The equipment operator will mix the fiber material into approximately 700 gallons of water. Upon the addition of all bags of the mulch material, the total batch will be agitated at about half speed for several minutes before application. The correct amount of all ingredients will be determined by the material supplier. The total amount of the hydromulch to be applied is directly proportional to the size (square feet) of the active work face and the extent of the compaction of the surface.

HYDROMULCH SYNTHETIC DAILY COVER
OPERATIONS PROCEDURE
COLONIAL LANDFILL
(Continued)

4. Application Procedure

Application of the hydromulch mixture shall be completed on the entire working face of the landfill at the end of the work day. This shall be accomplished by directing the flow of hydromulch into the air and allowing it to rain down onto the prepared surface. The operator shall apply the mulch from two directions to ensure that all areas are covered and all shadowing is eliminated. Complete coverage is required to meet LAC 33:VII.711.B.2 for controlling disease vectors, fire, odors, vermin, blowing litter, scavenging and creating acceptable aesthetics. The hydromulch mixture shall be applied to a thickness of ¼" or greater. A standard hydroseeding machine modified for landfill use as required shall be used to apply the hydromulch material.

If inclement weather conditions or soil conditions render the placement of hydromulch as a daily cover ineffective, the landfill shall temporarily revert to using another approved daily cover such as portable synthetic cover or 6" of soil cover.

The hydromulch mixture shall be non-toxic, non-combustible, totally biodegradable, and harmless to fish, birds, plants, and animals.

5. Operation Plan

(a) The hydromulch mix shall be applied as daily cover on a well compacted, relatively smooth and prepared solid waste surface.

(b) Materials shall be mixed and applied to the entire daily working face in accordance with the manufacturers' specifications.

(c) The applications shall be completed at the end of each work day.

(d) The hydromulch mixture shall be applied with a landfill modified hydroseeder to a thickness of ¼" or greater.

(e) The hydromulch slurry shall be allowed to dry for approximately one to two hours depending on weather conditions. Should rainfall occur prior to completion of the drying period, the daily work cell shall be covered with 6" soil cover or portable synthetic cover.

(f) Traffic will be restricted over the areas covered until the hydromulch material had dried completely.

(g) Hydromulch shall not be applied in the rain or immediately preceding a rain. During inclement weather, other approved materials shall be used for daily cover.

(h) Hydromulch shall not be applied if the air temperature is 40°F and falling.

(i) An acceptably completed application of hydromulch may be left in place for up to seven (7) calendar days provided that the surface has not been damaged or deteriorated. After seven days, such areas shall either receive additional waste, another full application of hydromulch, or 6" of soil cover.

APPENDIX T

QA/QC PROCEDURES FOR CLAY LINER AND CAP CONSTRUCTION/ CQA PLAN FOR SYNTHETIC BOTTOM AND CAP LINER INSTALLATION

QA/QC PROCEDURES FOR CLAY LINER AND CAP CONSTRUCTION

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
SORRENTO, LOUISIANA
ASCENSION PARISH

SOLID WASTE LANDFILL
FINAL COVER SYSTEM INSTALLATION
QUALITY ASSURANCE/QUALITY CONTROL
(QA/QC) PLAN

JUNE 2007

Prepared By:

PROVIDENCE

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, LA 70802
(225) 766-7400

Providence Engineering Project No. 018-005-016

TABLE OF CONTENTS

1.0 INTRODUCTION

This Final Cover Installation Quality Assurance/Quality Control (QA/QC) Plan has been developed to ensure that the final cover system for the Colonial Landfill (the landfill) is designed, constructed, and installed in accordance with the Solid Waste Permit for this landfill. This plan shall be implemented for all final closure activities associated with the landfill.

The final cover system of the landfill shall consist of one of the following options:

Option 1

Components from Bottom to Top:

- Clay Layer (recompacted) – 24-inches thick with a maximum permeability of 1 x 10^{-7} centimeters per second (cm/s)
- Synthetic Liner [40-mil High Density Polyethylene (HDPE) Liner] over flatter portions
- Top Soil – 6-inches thick

Option 2

Components from Bottom to Top:

- Geosynthetic Clay Liner (GCL - reinforced GCL is required on side slopes)
- Synthetic Liner (40-mil HDPE Liner) over flatter portions
- Top Soil – 18-inches thick

Each of the following sections provides specifications for the installation of each impermeable liner component. The topsoil shall be a loamy soil capable of supporting a good stand of vegetation.

2.0 CLAY LAYER (for Option 1)

2.1 General

Final cover areas shall be constructed to lines, grades, and cross sections as permitted in the landfill's Solid Waste Standard Permit. Any brush, roots, sod, or other perishable or unsuitable materials shall be removed prior to placement. The clay material shall be maintained in a satisfactory manner until the final completion of the actual installation. Subsequent to preparation of the final grading of the waste, a minimum 2-foot thick recompacted clay layer shall be constructed. The clay liner shall be constructed using the suitable clayey materials stockpiled from the excavation of future cells or from nearby sources.

In general, construction of the clay layer will be accomplished by spreading and blading the clay with bulldozers, wetting the clay if needed, and compacting each lift with cleated compactors.

The stockpiled suitable clay material from the excavation shall be loosely distributed in lifts sufficient to achieve a six inch, maximum compacted thickness. Clay layer thickness should be periodically surveyed by the contractor for construction purposes.

Compaction is achieved by rolling each loose lift with several passes of a cleated compactor or equivalent method. The upper one to two inches of compacted lift shall then be scarified in order to allow bonding between lifts. This process shall be continued until the design grade elevations are reached.

Once a minimum of two feet of clay layer is verified through a grid survey, the areas of the clay layer surface that are to receive the synthetic liner shall be smooth drummed rolled and wetted, if necessary, in order to prepare the surface for synthetic liner placement. Surveyed thickness verification shall be reported in the final "as-built" drawings.

2.2 QA/QC

The QA/QC criteria for clay layer placement, compaction, testing (lab and field), frequencies, and performance are provided below.

2.2.1 Visual Observation

The QC field representatives shall be present to observe placement and compaction of the clay liner. The visual observations associated with the various tasks include the following:

Placement:

- Observe material type and moisture content for material specifications
- Monitor uncompacted lift thickness and bonding techniques
- Monitor clod size
- Observe water application

Compaction:

- Observe compaction equipment, number of passes, *etc.*
- Observe compacted lift thickness

2.2.2 *Field Testing*

Field testing of the clay layer shall consist of performing moisture content and unit weight determinations [by nuclear methods – American Society for Testing and Materials (ASTM) D3017 and ASTM D2922, respectively] on compacted lifts as necessary to evaluate compaction conditions. The resulting holes created by the nuclear gauge test shall be backfilled with clay layer material or bentonite for sealing.

The clay layer material shall be compacted to a dry density greater than or equal to 90 percent of the maximum dry density and shall be at a moisture content of 2 to 10 percent greater than optimum as determined by the Standard Proctor Compaction Test, ASTM Standard D-698 or to a density and moisture content that is determined to yield a permeability of $1x10^{-7}$ cm/s, whichever is more stringent.

Compaction tests shall be performed at the minimum rate of 8 tests per acre per lift. In the event of test failure, additional compaction efforts shall be expended until the material in the vicinity of the test meets specifications.

2.2.3 *Laboratory Testing*

Laboratory testing of the clay layer material shall consist of particle size analyses (ASTM D1140), Atterberg limits determinations (ASTM D4318), moisture content and unit weight determinations (ASTM D2216), moisture/density relationships (standard Proctor compaction tests-ASTM D698), and permeability tests (*i.e.* tests following Appendix VII, Permeability Tests, of the U.S. Army Corps of Engineers, Engineering and Design, Laboratory Soils Testing manual, publication number EM 1110-2-1906, dated November 30, 1970 or other approved methods).

A minimum of one sample from the clay borrow source shall be tested for Atterberg limit determinations (ASTM D4318), particle size analyses (ASTM D1140) and moisture/density relationship, and moisture/density versus permeability relationship prior to construction of the clay layer. These tests shall be reconducted every 10,000 cubic yards of borrow material or when a visual change in the borrow material is observed.

Samples of the undisturbed in-place clay layer shall be collected for analyses as described later in this section. Undisturbed sampling will be accomplished by using a three-inch diameter drive tube, at least 6 inches in length, in a manner essentially

conforming to Paragraph 6 of ASTM D2937. The resulting holes will be backfilled with tamped and wetted clay layer material or bentonite pellets. The samples shall be trimmed, identified, placed into individual bags for moisture retention, and transported to an approved geotechnical laboratory under chain-of-custody control.

Laboratory permeability tests shall be performed on the collected clay layer samples at the minimum rate of 1 test per one acre of linear surface area per lift. In the event of test failure, additional compaction efforts shall be expended until the material in the vicinity of the test meets specifications. An additional test will be performed in the vicinity of the failure to verify that the additional compactive effort remedied the area of test failure.

3.0 SYNTHETIC LINER (for Option 1 and 2)

3.1 General

The synthetic liner shall be installed on specified portions of the final cover. The synthetic liner used for this project shall consist of a minimum 40-mil thickness HDPE geomembrane liner. The following paragraphs discuss the QA/QC requirements for the synthetic liner. A visual inspection log shall be maintained for the QA activities to ensure the materials are properly installed.

The synthetic liner is deployed using a backhoe, front-end loader, or equivalent. A rod shall be inserted through the longitudinal axis of each roll. This rod allows for each roll to be suspended by the equipment and material unrolled.

Each piece of synthetic liner cut from a roll shall be termed a panel. In order to keep unwelded panels or a section from blowing in the wind, sand bags or equivalent may be used to secure the material. The panels shall be connected by fusion welding and extrusion. Once welding is completed, the liner system shall be secured in anchor trenches.

3.2 QA/QC of Synthetic Liner

The QA/QC criteria for the synthetic liner is discussed below.

3.2.1 Visual Observation

The QC Inspector shall be on-site to observe the delivery, deployment, and seaming of the synthetic liner. The visual observations associated with the various tasks shall include:

Material Delivery:

- Collection of manufacturer's material certification sheets
- Inspection for obvious defects
- Inventory of delivered goods
- Handling protocols to prevent material damage
- Preservation provisions during temporary storage

Deployment:

- Clay layer surface preparation
- Handling protocols to prevent material damage
- Seam overlap provisions
- Temporary securing methods
- As-built documentation (panel placement)
- Traffic on deployed material

Seaming:

- Weather conditions
- Trial welding
- Overlap preparation (cleaning and/or grinding)
- Dust control
- Non-destructive seam testing
- As-built documentation (seam identifications)
- Traffic on seamed materials

All areas to receive synthetic liner shall be visually inspected for smoothness, voids, and ruts prior to deployment. All areas shall be accepted by the synthetic liner installer prior to deployment.

3.2.2 Field Testing

Field seaming and testing shall be performed by the installer. The testing includes trail welds and non-destructive seam testing. These tests shall be observed and documented by QA/QC personnel.

Field seaming shall be accomplished primarily using fusion welding. Fusion welding consists of creating a double seam with an interstitial air channel by fusing the seams with heat. Repair areas and areas difficult to access shall be seamed using

extrusion welding. Extrusion welding consists of creating a single weld by applying heat and extrudate.

The entire length of each weld shall be non-destructively tested. Non-destructive seam testing of extrusion welds shall be accomplished using a vacuum box or equivalent methods. Fusion welds shall be tested by pressure tests or equivalent methods.

Vacuum box testing consists of covering the extrusion weld with a soapy water solution and placing the extrusion weld under a suction using a clear plastic suction cup attached to a vacuum pump. The suction shall be held for at least 30 seconds, during which time the test area will be observed for a foaming agent. The foaming agent will indicate the exact location of any leak.

Pressure testing consists of applying air pressure [>30 pounds per square inch gauge (psig)] to the interstitial air channel of the weld. The pressure shall be held for at least five minutes. A pressure drop of 3 pounds per square inch (psi) or greater indicates a leak of the weld. At the end of the test, the opposite end of the seam will be cut to ensure a drop in pressure across the entire length of the seam and to ensure the channel is not blocked.

All seams shall also be inspected to ensure that a minimum overlap of 4 inches is maintained during welding.

While welding is being performed, temperature gauges shall be checked to ensure correct settings are maintained and alignment of welding apparatus is proper. Test seam samples are to be obtained at least once daily on each welder and machine used that day, and the QA/QC test procedures are followed for machine and welder acceptance.

QA/QC representatives shall be present during all panel deployment and seaming activities. Trial welds will be performed and tested at least twice daily. All welds shall be visually inspected and continuously tested as required by the specifications.

3.2.3 Laboratory Testing

Samples of the welds shall be removed from seams for laboratory testing. Laboratory testing of the synthetic liner shall consist of conformance testing performed by an approved laboratory. All locations where destructive seam samples are obtained shall be repaired by patching with a synthetic liner, and the patches shall

be retested for tightness. The patching shall be field tested as described in Section 3.2.2.

Destructive testing of welded synthetic liner seams shall include shear and peel strengths. The testing shall be at a frequency of one destructive sample for each 500 linear feet of welded synthetic liner seam. For each laboratory sample, three coupons shall be tested in shear, and three coupons shall be tested in peel.

Dual hot wedge fusion welds are considered passing in peel when:

- Failure is by Film Tear Bond (FTB)
- Yield strength is not less than 60% of the unseamed sheet failure

Extrusion fillet welds are considered passing in peel when:

- Failure is by FTB
- Yield strength is not less then 60% of the unseamed sheet failure

Fusion and extrusion welds are considered passing in shear when:

- Failure is by FTB
- Yield strength is not less than 80% of the unseamed sheet failure

4.0 Geosynthetic Clay Liner (for Option 2)

4.1 General

The GCL shall be installed as part of the final cover for Option 2. The following paragraphs discuss the QA/QC requirements for the GCL. A visual inspection log shall be maintained for the QA activities to ensure the materials are properly installed.

The GCL will be deployed using a backhoe, front-end loader, or equivalent. A rod shall be inserted through the longitudinal axis of each roll. This rod allows for each roll to be suspended by the equipment and material unrolled.

4.2 QA/QC of GCL

The QA/QC criteria for the GCL is discussed below.

4.2.1 Visual Observation

The QC Inspector shall be onsite to observe the delivery, deployment, and seaming of the GCL. The visual observations associated with the various tasks shall include the following:

Material Delivery:

- Collection of manufacturer's material certification sheets
- Inspection for obvious defects. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. The packaging should be repaired prior to being placed in storage
- Inventory of delivered goods
- Handling protocols to prevent material damage
- Preservation provisions during temporary storage: Storage of the GCL rolls shall be the responsibility of the installer. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry, and well-drained. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four rolls). All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation. The integrity and legibility of the labels shall be preserved during storage.

Deployment:

- Subgrade preparation: Any earthen surface upon which the GCL is installed shall be prepared and compacted in accordance with the project specifications and drawings. The surface shall be smooth, firm, and unyielding, and free of vegetation, construction debris, sticks, sharp rocks, void spaces, ice, abrupt elevation changes, standing water, cracks larger than one-quarter inch (6 mm) in width, and any other foreign matter that could contact the GCL. On a continuing basis, the project Construction Quality Assurance (CQA) inspector shall certify acceptance of the subgrade before GCL placement.

- Handling protocols to prevent material damage: Immediately prior to deployment, the packaging should be carefully removed without damaging the GCL. Only as much GCL shall be deployed as can be covered at the end of the working day with soil, a geomembrane, or a temporary waterproof tarpaulin. The GCL shall not be left uncovered overnight.
- Traffic on deployed material: Equipment that could damage the GCL shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

Seaming:

- Weather conditions: If the GCL is hydrated when no confining stress is present, it may be necessary to remove and replace the hydrated material.
- Overlap preparation (cleaning): Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.
- Supplemental bentonite is required for reinforced GCL. The minimum dimension of the longitudinal overlap should be 1-foot (300 mm). End-of-roll overlapped seams should be similarly constructed, but the minimum overlap should measure 24 inches (600 mm).
- Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.
- Bentonite-enhanced seams are constructed between the overlapping adjacent panels. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 1 foot (300 mm) line. A similar bead of granular sodium bentonite is applied at the end-of-roll overlap. The granular bentonite shall be applied at a minimum application rate of one quarter pound per linear foot [0.4 kilograms per meter (kg/m)].

4.2.2 Material Specifications

The GCL shall be of new, first quality material. The QC Inspector must ensure from the manufacturer's certification that the GCLs

meets the minimum requirements, as presented in the tables below, prior to placement.

Reinforced GCL

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY, ft^2 (m^2)	REQUIRED VALUES
GCL Grab Strength	ASTM D 4632	200,000 ft^2 (20,000 m^2)	90 lbs (400 N)
GCL Peel Strength	ASTM D 4632	40,000 ft^2 (4,000 m^2)	15 lbs (65 N)
GCL Hydraulic Conductivity	ASTM D 5887	Weekly	5×10^{-9} cm/s
GCL Hydrated Internal Shear Strength	ASTM D 5321	Periodic	500 psf (24 kPa) typical

Unreinforced GCL

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY, ft^2 (m^2)	REQUIRED VALUES
GCL Grab Strength	ASTM D 4632	200,000 ft^2 (20,000 m^2)	75 lbs (330 N)
GCL Peel Strength	ASTM D 4632	N/A	N/A
GCL Permeability	ASTM D 5887	Weekly	5×10^{-9} cm/s
GCL Hydrated Internal Shear Strength	ASTM D 5321	Periodic	50 psf (2.4 kPa) typical

CQA PLAN FOR SYNTHETIC BOTTOM AND CAP LINER INSTALLATION

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
SORRENTO, LOUISIANA
ASCENSION PARISH

SOLID WASTE LANDFILL
BOTTOM LINER SYSTEM INSTALLATION
QUALITY ASSURANCE/QUALITY CONTROL
(QA/QC) PLAN

JUNE 2007

Prepared By:

PROVIDENCE

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Providence Engineering Project No. 018-005-016

TABLE OF CONTENTS

1.0 INTRODUCTION

This Bottom Liner Installation Quality Assurance/Quality Control (QA/QC) Plan has been developed to ensure that the bottom impermeable liner system for the Colonial Landfill (the landfill) is designed, constructed, and installed in accordance with the Solid Waste Permit for this landfill. This plan shall be implemented for all cell construction activities associated with the landfill.

The bottom impermeable liner system of the landfill shall consist of one of the following options:

Option 1

Components from Bottom to Top:

- Clay Layer (recompacted) – 36-inches thick with a maximum permeability of 1 x 10^{-7} centimeters per second (cm/s)
- Synthetic Liner (60-mil High Density Polyethylene [HDPE] Liner)

Option 2

Components from Bottom to Top:

- Clay Layer (recompacted) – 12-inches thick with a maximum permeability of 1 x 10^{-7} cm/s
- Synthetic Liner (40-mil HDPE Liner)
- Geosynthetic Clay Liner (GCL - reinforced GCL is required on side slopes)
- Synthetic Liner (60-mil HDPE Liner)

Each of the following sections provides specifications for the installation of each impermeable liner component.

2.0 CLAY LINER (for Option 1 and 2)

2.1 General

Cell areas shall be constructed to lines, grades, and cross sections as permitted in the landfill's Solid Waste Standard Permit. Any brush, roots, sod, or other perishable or unsuitable materials shall be removed prior to placement. The clay material shall be maintained in a satisfactory manner until the final completion of the actual installation. Subsequent to final grading of the construction area, a minimum three-foot (Option 1) or one-foot (Option 2) thick recompacted clay liner shall be constructed. The clay liner shall be constructed using the suitable clayey materials stockpiled from the excavation of the current cell, future cells, or from nearby sources.

In general, construction of the clay liner will be accomplished by spreading and blading the clay with bulldozers, wetting the clay if needed, and compacting each lift with cleated compactors.

The stockpiled suitable clay material from the excavation shall be loosely distributed in lifts sufficient to achieve a six inch, maximum compacted thickness. Clay liner thickness should be periodically surveyed by the contractor for construction purposes.

Compaction is achieved by rolling each loose lift with several passes of a cleated compactor or equivalent method. The upper one to two inches of compacted lift shall then be scarified in order to allow bonding between lifts. This process shall be continued until the design grade elevations are reached.

Once the minimum thickness of clay liner is verified through a grid survey, the clay liner surface shall be smooth drummed rolled and wetted, if necessary, in order to prepare the surface for synthetic liner placement. Surveyed thickness verification shall be reported in the final "as-built" drawings.

2.2 QA/QC

The QA/QC criteria for clay liner placement, compaction, testing (lab and field), frequencies, and performance are provided below.

2.1.1 Visual Observation

The QC field representatives shall be present to observe placement and compaction of the clay liner. The visual observations associated with the various tasks include the following:

Placement:

- Observe material type and moisture content for material specifications
- Monitor uncompacted lift thickness and bonding techniques
- Monitor clod size
- Observe water application

Compaction:

- Observe compaction equipment, number of passes, *etc.*
- Observe compacted lift thickness

2.1.2 *Field Testing*

Field testing of the clay liner shall consist of performing moisture content and unit weight determinations [by nuclear methods – American Society for Testing and Materials (ASTM) D3017 and ASTM D2922, respectively] on compacted lifts as necessary to evaluate compaction conditions. The resulting holes created by the nuclear gauge test shall be backfilled with clay liner material or bentonite for sealing.

The clay liner material shall be compacted to a dry density greater than or equal to 90 percent of the maximum dry density and shall be at a moisture content of 2 to 10 percent greater than optimum as determined by the Standard Proctor Compaction Test, ASTM Standard D-698 or to a density and moisture content that is determined to yield a permeability of $1x10^{-7}$ cm/s, whichever is more stringent.

Compaction/moisture content tests shall be performed at the minimum rate of 12 tests per acre per lift. In the event of test failure, additional compaction efforts shall be expended until the material in the vicinity of the test meets specifications.

2.1.3 *Laboratory Testing*

Laboratory testing of the clay liner material shall consist of particle size analyses (ASTM D1140), Atterberg limits determinations (ASTM D4318), moisture content and unit weight determinations (ASTM D2216), moisture/density relationships (standard Proctor compaction tests-ASTM D698), and permeability tests (*i.e.* tests following Appendix VII, Permeability Tests, of the U.S. Army Corps of Engineers, Engineering and Design, Laboratory Soils Testing manual, publication number EM 1110-2-1906, dated November 30, 1970 or other approved methods).

A minimum of one sample from the clay borrow source shall be tested for Atterberg limit determinations (ASTM D4318), particle size analyses (ASTM D1140) and moisture/density relationship, and moisture/density versus permeability relationship prior to construction of the clay liner. These tests shall be reconducted every 10,000 cubic yards of borrow material or when a visual change in the borrow material is observed.

Samples of undisturbed in-place clay liner shall be collected for analyses as described later in this section. Undisturbed sampling will be accomplished by using a three-inch diameter drive tube, at least 6 inches in length, in a manner essentially conforming to Paragraph 6 of ASTM D2937. The resulting holes will be

backfilled with tamped and wetted clay liner material or bentonite pellets. The samples shall be trimmed, identified, placed into individual bags for moisture retention, and transported to an approved geotechnical laboratory under chain-of-custody control.

Laboratory permeability tests shall be performed on the collected clay liner samples at the minimum rate of 1 test per acre of linear surface area per lift. In the event of test failure, additional compaction efforts shall be expended until the material in the vicinity of the test meets specifications. An additional test will be performed in the vicinity of the failure to verify that the additional compactive effort remedied the area of test failure.

3.0 SYNTHETIC LINER (for Option 1 and 2)

3.1 General

The synthetic liner shall be installed at the locations specified in the project plans. The synthetic liners used for this project shall consist of a minimum 40-mil thickness HDPE geomembrane liner and/or a 60-mil HDPE geomembrane liner, dependent upon the option selected. The following paragraphs discuss the QA/QC requirements for the synthetic liners. A visual inspection log shall be maintained for the QA activities to ensure the materials are properly installed.

The synthetic liner is deployed using a backhoe, front-end loader, or equivalent. A rod shall be inserted through the longitudinal axis of each roll. This rod allows for each roll to be suspended by the equipment and material unrolled.

Each piece of synthetic liner cut from a roll shall be termed a panel. In order to keep unwelded panels or a section from blowing in the wind, sand bags or equivalent may be used to secure the material. The panels shall be connected by fusion welding and extrusion. Once welding is completed, the liner system shall be secured in anchor trenches.

3.2 QA/QC of Synthetic Liner

The QA/QC criteria for the synthetic liner is discussed below.

3.2.1 Visual Observation

The QC Inspector shall be on-site to observe the delivery, deployment, and seaming of the synthetic liner. The visual observations associated with the various tasks shall include:

Material Delivery:

- Collection of manufacturer's material certification sheets

- Inspection for obvious defects
- Inventory of delivered goods
- Handling protocols to prevent material damage
- Preservation provisions during temporary storage

Deployment:

- Clay liner surface preparation
- Handling protocols to prevent material damage
- Seam overlap provisions
- Temporary securing methods
- As-built documentation (panel placement)
- Traffic on deployed material

Seaming:

- Weather conditions
- Trial welding
- Overlap preparation (cleaning and/or grinding)
- Dust control
- Non-destructive seam testing
- As-built documentation (seam identifications)
- Traffic on seamed materials

All areas to receive synthetic liner shall be visually inspected for smoothness, voids, and ruts prior to deployment. All areas shall be accepted by the synthetic liner installer prior to deployment.

3.2.2 Field Testing

Field seaming and testing shall be performed by the installer. The testing includes trail welds and non-destructive seam testing. These tests shall be observed and documented by QA/QC personnel.

Field seaming shall be accomplished primarily using fusion welding. Fusion welding consists of creating a double seam with an interstitial air channel by fusing the seams with heat. Repair areas and areas difficult to access shall be seamed using extrusion welding. Extrusion welding consists of creating a single weld by applying heat and extrudate.

The entire length of each weld shall be non-destructively tested. Non-destructive seam testing of extrusion welds shall be accomplished using a vacuum box or equivalent methods. Fusion welds shall be tested by pressure tests or equivalent methods.

Vacuum box testing consists of covering the extrusion weld with a soapy water solution and placing the extrusion weld under a suction using a clear plastic suction cup attached to a vacuum pump. The suction shall be held for at least 30 seconds, during which time the test area will be observed for a foaming agent. The foaming agent will indicate the exact location of any leak.

Pressure testing consists of applying air pressure [>30 pounds per square inch gauge (psig)] to the interstitial air channel of the weld. The pressure shall be held for at least five minutes. A pressure drop of 3 psi or greater indicates a leak of the weld. At the end of the test, the opposite end of the seam will be cut to ensure a drop in pressure across the entire length of the seam and to ensure the channel is not blocked.

All seams shall also be inspected to ensure that a minimum overlap of 4 inches is maintained during welding.

While welding is being performed, temperature gauges shall be checked to ensure correct settings are maintained and alignment of welding apparatus is proper. Test seam samples are to be obtained at least once daily on each welder and machine used that day, and the QA/QC test procedures are followed for machine and welder acceptance.

The welds around the pipe penetrations for the lateral extensions will be tested using the mechanical point stress (pick) test in addition to extensive visual observations.

The pick test on the seam involves inserting a dull object (screwdriver) under the top edge of the seam and working the object around the entire pipe to detect any unbonded areas. The geosynthetics installer will be responsible for conducting the pick test around all pipe penetrations.

In addition to the mechanical point stress (pick) test, the welds around the pipe penetrations for the lateral extensions will be spark tested. Spark testing of these welds involves inserting a small gauge copper wire between the pipe penetration and the HDPE liner prior to the welding of the two. After the extrusion weld is performed, a wand containing an electric charge is inserted between the pipe penetration and the HDPE membrane. In the event the wire is not completely encapsulated by the extrusion weld, a spark will be made between the electric wand and the copper wire. If a spark is detected, additional extrusion welding will be conducted in that area. The weld will be retested and will be considered passing until no sparks are detected.

QA/QC representatives shall be present during all panel deployment and seaming activities. Trial welds will be performed and tested at least twice daily. All welds shall be visually inspected and continuously tested as required by the specifications.

3.2.3 Laboratory Testing

Samples of the welds shall be removed from seams for laboratory testing. Laboratory testing of the synthetic liner shall consist of conformance testing performed by an approved laboratory. All locations where destructive seam samples are obtained shall be repaired by patching with a synthetic liner, and the patches shall be retested for tightness. The patching shall be field tested as described in Section 3.2.2

Destructive testing of welded synthetic liner seams shall include shear and peel strengths. The testing shall be at a frequency of one destructive sample for each 500 linear feet of welded synthetic liner seam. For each laboratory sample, three coupons shall be tested in shear, and three coupons shall be tested in peel.

Dual hot wedge fusion welds are considered passing in peel when:

- Failure is by Film Tear Bond (FTB)
- Yield strength is not less than 60% of the unseamed sheet failure

Extrusion fillet welds are considered passing in peel when:

- Failure is by FTB
- Yield strength is not less then 60% of the unseamed sheet failure

Fusion and extrusion welds are considered passing in shear when:

- Failure is by FTB
- Yield strength is not less than 80% of the unseamed sheet failure

4.0 Geosynthetic Clay Liner (for Option 2)

4.1 General

The GCL shall be installed as part of the bottom liner for Option 2. The following paragraphs discuss the QA/QC requirements for the GCL. A

visual inspection log shall be maintained for the QA activities to ensure the materials are properly installed.

The GCL will be deployed using a backhoe, front-end loader, or equivalent. A rod shall be inserted through the longitudinal axis of each roll. This rod allows for each roll to be suspended by the equipment and material unrolled.

4.2 QA/QC of GCL

The QA/QC criteria for the GCL is discussed below.

4.2.1 Visual Observation

The QC Inspector shall be onsite to observe the delivery, deployment, and seaming of the GCL. The visual observations associated with the various tasks shall include the following:

Material Delivery:

- Collection of manufacturer's material certification sheets.
- Inspection for obvious defects. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. The packaging should be repaired prior to being placed in storage.
- Inventory of delivered goods.
- Handling protocols to prevent material damage.
- Preservation provisions during temporary storage: Storage of the GCL rolls shall be the responsibility of the installer. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry, and well-drained. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four rolls). All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation. The integrity and legibility of the labels shall be preserved during storage.

Deployment:

- Subgrade preparation: Any surface upon which the GCL is installed shall be prepared and compacted in

accordance with the project specifications and drawings. The surface shall be smooth, firm, and unyielding, and free of vegetation, construction debris, sticks, sharp rocks, void spaces, ice, abrupt elevation changes, standing water, cracks larger than one-quarter inch (6 mm) in width, and any other foreign matter that could contact the GCL. On a continuing basis, the project Construction Quality Assurance (CQA) inspector shall certify acceptance of the subgrade before GCL placement.

- Handling protocols to prevent material damage: Immediately prior to deployment, the packaging should be carefully removed without damaging the GCL. Only as much GCL shall be deployed as can be covered at the end of the working day with soil, a geomembrane, or a temporary waterproof tarpaulin. The GCL shall not be left uncovered overnight.
- Traffic on deployed material: Equipment that could damage the GCL shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

Seaming:

- Weather conditions: If the GCL is hydrated when no confining stress is present, it may be necessary to remove and replace the hydrated material.
- Overlap preparation (cleaning): Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.
- Supplemental bentonite is required for reinforced GCL. The minimum dimension of the longitudinal overlap should be 1-foot (300 mm). End-of-roll overlapped seams should be similarly constructed, but the minimum overlap should measure 24 inches (600 mm).
- Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.
- Bentonite-enhanced seams are constructed between the overlapping adjacent panels. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 1 foot (300 mm) line. A similar bead of granular sodium bentonite is applied at the end-of-roll overlap. The

granular bentonite shall be applied at a minimum application rate of one quarter pound per linear foot [0.4 kilograms per meter (kg/m)].

4.2.2 Material Specifications

The GCL shall be of new, first quality material. The QC Inspector must ensure from the manufacturer's certification that the GCLs meets the minimum requirements as presented in the tables below, prior to placement.

Reinforced GCL

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY, ft^2 (m^2)	REQUIRED VALUES
GCL Grab Strength	ASTM D 4632	200,000 ft^2 (20,000 m^2)	90 lbs (400 N)
GCL Peel Strength	ASTM D 4632	40,000 ft^2 (4,000 m^2)	15 lbs (65 N)
GCL Hydraulic Conductivity	ASTM D 5887	Weekly	5×10^{-9} cm/s
GCL Hydrated Internal Shear Strength	ASTM D 5321	Periodic	500 psf (24 kPa) typical

Unreinforced GCL

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY, ft^2 (m^2)	REQUIRED VALUES
GCL Grab Strength	ASTM D 4632	200,000 ft^2 (20,000 m^2)	75 lbs (330 N)
GCL Peel Strength	ASTM D 4632	N/A	N/A
GCL Permeability	ASTM D 5887	Weekly	5×10^{-9} cm/s
GCL Hydrated Internal Shear Strength	ASTM D 5321	Periodic	50 psf (2.4 kPa) typical

APPENDIX U

GROUNDWATER SAMPLING AND ANALYSIS PLAN

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
ASCENSION PARISH

GROUNDWATER SAMPLING AND ANALYSIS PLAN

JUNE 2007

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Providence Engineering Project No. 018-005-016

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1.0 INTRODUCTION

This Ground Water Sampling and Analysis Plan (GWSAP) has been prepared for the BFI-Colonial Landfill Site (Louisiana Department of Environmental Quality [LDEQ] Solid Waste Permit Number P-0021). The BFI-Colonial Landfill is a Type I and Type II Disposal Facility located off Highway 70 in Sorrento, Louisiana.

The following plan covers the procedures for collecting representative samples from groundwater monitoring wells and the basic laboratory requirements for obtaining valid, defensible data. The plan is limited to sampling and analysis requirements and does not include monitoring well placement, design and construction, or well development procedures.

2.0 FIELD PROCEDURES

2.1 Basic Elements for a Field Sampling Health and Safety Plan

A health and safety plan is required for all groundwater sampling events at the BFI-Colonial Landfill. This GWSAP lists some general safety precautions which should be incorporated into the site health and safety plan; however, this document in no way constitutes the site health and safety plan. Prior to monitoring well purging and sampling, a proper Ground Water Sampling Health and Safety Plan must be in place. The responsibility of Designing the site Ground Water Sampling Health and Safety Plan will be the duty of the party performing the actual work and at a minimum, the plan should:

- Name key personnel and alternates responsible for site safety
- Describe the risks associated with ground water sampling field operations
- Confirm that field personnel are adequately trained to perform their job responsibilities and to handle the specific hazardous situations they may encounter
- Describe the protective clothing and equipment to be worn by personnel during ground water sampling operations
- Describe the field program for periodic air monitoring, any personnel monitoring, especially to address any potential landfill gas (see Section 2.1.4)
- Describe the actions to be taken to mitigate any existing field hazards
- Define site and sampling point access measures and include a site map with sampling point locations marked
- Establish any required field decontamination procedures for personnel and/or equipment
- Set forth the field standard operating procedures utilized by the firm collecting the samples

- Set forth a field contingency plan for safe and effective response to emergencies including maps of emergency routes on and off site with location(s) of nearest hospitals

The GWSAP lists some general safety precautions which must be met by a health and safety plan. This should not be construed as an exhaustive list of all such precautions.

A health and safety plan is developed to assist personnel in understanding and avoiding potential health and safety hazards that may be associated with ground water sampling at a municipal solid waste landfill. This plan shall be reviewed by the sampling crew prior to each sampling event and each individual involved in the sample collection process should be knowledgeable in the contents and implementation of this plan.

2.1.1 Potential Hazards

Potential hazards associated with ground water sampling at a municipal solid waste landfill consist of the following:

- Landfill equipment traffic
- Other vehicle traffic
- Inhalation of airborne contaminants, including landfill gas
- Splash-hazard from handling ground water samples, resulting in skin contact with or ingestion of potentially contaminated water
- Explosion of landfill gases at the well head
- Snakes, insects, poison ivy, etc.
- Exposure to extreme temperatures of heat and cold

In the event contaminants are detected, the health and safety plan must list maximum concentrations of the known contaminants, along with the OSHA permissible exposure limits for each contaminant. In addition, it must address potential symptoms of exposure to the contaminant.

2.1.2 Personal Protective Equipment

The following level of protection is anticipated for ground water sampling events. Levels of protection are as defined by OSHA. Higher levels of protection will be used as dictated by site conditions.

<u>Level D Protection</u>

- Coveralls
- Safety boots/shoes
- Safety glasses or chemical splash goggles
- Disposable gloves

2.1.3 Decontamination Procedures

Decontamination of ground water purging and sampling equipment is addressed in Section 2.2.4. Decontamination of personnel during ground water sampling events will consist of discarding disposable gloves and washing hands with soap and water after sampling procedures are completed and prior to eating and drinking.

2.1.4 Other

- A MSA Gascope Combustible Gas Indicator or equivalent device will be used to check each monitoring well for the presence of methane gas. Measurements are to be taken immediately after the well cap has been removed. All necessary calibrations and maintenance procedures found in the manufacturer's operation manual are to be followed. Calibration information and monitoring results are to be recorded on the BFI Field Information Log.

- Absolutely no smoking is allowed during ground water sampling procedures.

- Water should be made available on site for drinking and decontamination purposes.

- Equipment should be cleaned prior to storage or transportation offsite. Suitable storage is required for all equipment and supplies.

- A first-aid kit and fire extinguisher must be maintained and carried in each vehicle used during ground water sampling events.

2.1.5 Emergency Assistance Information

The following information is provided in case of an emergency.

Acute Exposure System(s):	First Aid:
• Eyes (slight to moderate irritation)	• Flush with water for 15 minutes
• Skin (irritation, redness, edema, drying)	• Wash with soap and water
• Respiratory (dizziness, irritation of eyes, nose, throat, vomiting, bluish skin, Central Nervous System [CNS] effects)	• Remove to fresh air
• Ingestion	• Do not induce vomiting (can cause chemical pneumonitis). Call physician.

Hospital:

Ascension Hospital
615 E. Worthey Road
Gonzales, LA 70737
(225) 621-1200

St. Elizabeth Hospital
1125 West Highway 30
Gonzales, LA 70737
(225) 647-5000

Emergency Transportation:

- Call 911

Emergency Route to Riverview Medical Center:

- Exit site right onto Highway 70 to Highway 22. Right on Highway 22 to Interstate 10. Take I-10 (left) going west and exit mile marker 179/Highway 44. Take a right onto Highway 44 to Highway 30. Take a left on Highway 30, two miles down on the left is Riverview Medical Center.

2.1.6 Personnel Acknowledgement

A form should be provided so that it may be documented that all personnel associated with the project have read and are familiar with the Ground Water Sampling Health and Safety Plan document. All ground water sampling personnel and project managers must sign the form, acknowledging that they have read and understand this document.

2.2 Sample Event Preparation and QA/QC

2.2.1 General Event Preparation

The laboratory performing the groundwater analysis shall supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, packaged refrigerant, labels, custody seals, chain-of-custody and shipping forms. All field data shall be entered on a BFI Field Information Log (see Figures B.1 through B.6 in Appendix B). Adequate instructions to the laboratory must be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures need to be given to the laboratory in writing prior to the field sampling personnel arriving on the site. A specific contact person shall be established at both the facility and contract laboratory for communication between the two (2) parties.

2.2.2 Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. Consult Figure B.7 (Appendix B), *Containerization and Preservation of Sam*ples, to determine the number, type and volume of appropriate containers. As noted in Section 2.2.1, the contract laboratory performing the analysis shall supply all the required containers. In special circumstances when the facility must obtain its own containers, these containers will be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon®) lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

2.2.3 Sample Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol. An example protocol is as follows:

- Bottles, vials, containers, liners and caps hand washed in a laboratory-grade, non-phosphate detergent
- Rinse three (3) times with distilled water
- Rinse with a chemically pure or reagent grade 10% nitric acid solution
- Rinse three (3) times with organic-free water
- Oven-dried (air-dried for high-density polyethylene containers and caps)

After containers and caps are cool and dry, cap each container and store in a clean and dry environment.

2.2.4 *Equipment Preparation Prior to Site Arrival*

Dedicated pump purge and sample devices for the BFI-Colonial Landfill are described in detail in Section 2.3.3 and 2.4.3. This section outlines the equipment preparation prior to site arrival for a specific monitoring event. This equipment preparation includes minimum decontamination procedures for water level indicator(s), pH/temperature meter, specific conductivity meter, turbidity meter and filtration device. Operation and calibration information for field instruments are contained in Appendix C.

- Water Level Indicator(s) – Water level indicator(s) will be decontaminated prior to initial site arrival by hand washing the sensor probe and entire length of tape in a laboratory grade non-phosphate detergent followed by a triple rinse with organic free water. While the tape is reeled back onto the carrying spool, the tape and probe will be wiped down with a clean dry paper towel.
- pH / Temperature Meter – Meters, both primary and back-up sets, will be decontaminated by hand washing the sample cells in a laboratory grade non-phosphate detergent followed by a triple rinse with organic free water. Meters will then be checked for proper calibration and operation as specified in Appendix C. Any malfunctioning meters will be replaced prior to packing.
- Specific Conductivity Meter – Meters, both primary and back-up sets, will be decontaminated by hand washing the probes in a laboratory grade non-phosphate detergent followed by a triple rinse with organic free water. Meters will then be checked for proper calibration and operation as specified in Appendix C. Any malfunctioning meters will be replaced prior to packing.
- Turbidity Meter – Meters, both primary and back-up sets will be decontaminated by hand washing the sample cells in a laboratory grade non-phosphate detergent followed by a triple rinse with organic free water. Meters will then be checked for proper calibration and operation as specified in Appendix C. Any malfunctioning meters will be replaced prior to packing.

In case of equipment failure, at least one back-up instrument will be in the sample crew's possession. If a back-up instrument is not available, or fails in addition to the primary equipment, sampling will not proceed until proper equipment is made available.

2.2.5 *Field QA/QC Samples*

Field QA/QC samples consist of two (2) primary areas of quality control. The first area is the quality control designed to prevent sample contamination from occurring in the field and/or shipping procedures. This is monitored in the trip blank(s), field blank(s), and the equipment (rinsate) blank(s). A basic description of each is as follows:

- Trip Blank – These samples will be prepared in the laboratory by filling the appropriate clean sample containers with organic-free water and adding the applicable chemical preservative, if any, as indicated on Figure B.7 for each type of sample. These containers are to be labeled "Trip Blank", the analyses to be performed on each container indicated, and then shipped in the typical transportation cooler to the field and back to the laboratory along with the other sample set containers for a given event. This blank is tested for any contamination that may occur as a result of the containers, sample coolers, cleaning procedures, or chemical preservatives used. Trip blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) in twenty (20) batch per monitoring event.

- Field Blank – Field blank containers will be prepared in the field at a routine sample collection point during a monitoring event by filling the appropriate sample containers from the field supply of organic-free water. This field supply water shall be the same water used for cleaning and decontamination of all field purge and sample equipment. This blank is tested for any contamination that may occur as a result of site ambient air conditions and serves as an additional check for contamination in the containers, sample transport coolers, cleaning procedures, and any chemical preservatives. Field blanks shall be taken and analyzed for each sampling event or a minimum of a one (1) in twenty (20) batch per monitoring event.

- Equipment (Rinsate) Blank – These blanks will be prepared in the field immediately following decontamination cleaning procedures on any non-dedicated equipment used for purging, sampling or sample filtration. Following decontamination, field supply organic-free water is passed through the non-dedicated equipment in the same procedure as a groundwater sample. This blank confirms proper field decontamination procedures on non-dedicated equipment utilized in the field. Equipment blanks shall be taken and analyzed for all applicable parameters anytime non-dedicated equipment is used or new equipment is being dedicated to a well at a batch minimum of one (1) in ten (10) per monitoring event.

Other Field QA/QC Samples – A second area of standard field QA/QC samples are field duplicates, matrix spike and matrix spike duplicates.

- Field duplicates are an extra set of samples taken at a particular monitoring point and labeled "Field Duplicate". These are independent samples which are collected as close as possible to the same point in space and time. They are two (2) separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling and analytical process. Samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter (e.g. VOA – VOA, metals – metals, etc.) Field duplicates shall be taken and analyzed at a batch minimum of one (1) in ten (10).

- Field samples for matrix spike and matrix spike duplicate analyses are taken in the same manner as field duplicates and allow sufficient volumes of sample to perform matrix spike and matrix spike duplicate analyses. Matrix spikes are those samples having a known amount of a target analyte added at the lab to the sample prior to sample preparation and analysis. The matrix spike is used to determine the bias of a method in a given sample matrix. Matrix spike duplicates are intralaboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs at the lab prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix.

2.3 Well Purge

2.3.1 General Well Purge Information

Purging a monitoring well is just as important as the subsequent sampling of the well. Water standing in a monitoring well over a certain period of time may become unrepresentative of formation water because of chemical and biochemical changes which may cause water quality alterations.
Prior to monitoring well purge, inspection of the monitoring well integrity will be performed utilizing the BFI Ground Water Monitoring Well Condition Report (see Figure B, Page 11 of Appendix B).

2.3.2 Water Level Measurement

Prior to any purge or sampling activity at each monitoring well, a water level measurement is required to be taken. Measurement of

the static water level is important is determining the hydrogeologic characteristics of the subsurface (e.g. upgradient and downgradient). Also, as indicated on the BFI Field Information Log (Figures B.1 through B.6), several other water level measurements are to be taken during the course of purge and sampling.

Water level indicator equipment will be constructed of chemically inert materials and, during mobilization preparation and following each monitoring point, will be decontaminated at each well with a non-phosphate detergent followed with multiple deionized water rinses. Decontamination water will be disposed of in each respective well's purge water containers. Water levels will be measured with a precision of ± 0.01 foot. Water level indicator devices will be checked at the laboratory on a regular basis for proper calibration, prior to each monitoring event by reeling a 50' and 100' length of tape on a clean surface and checking the length with a steel measuring tape. Any discrepancies will be noted as a correction factor on the side water level reel.

Each monitoring well shall have a reference elevation point located at the wellhead seal access port measured by a licensed surveyor. This reference point elevation is measured in relation to Mean Sea Level (MSL). Basic procedures for water level measurement is indicated on Figure C.11.

Ground water elevations in wells which monitor the same waste management area must be measured within a forty-eight (48) hour period to avoid temporary variations in ground water flow which could preclude accurate determination of ground water flow rate and direction.

In addition to the static water level, a total well depth will be measured at each monitoring well annually. Well depth can be taken with a water level indicator device since the probe is heavy enough to keep the tape measure straight and to "feel" the bottom of the well. If 10 percent of the screened interval is blocked by sediments, the well must be redeveloped prior to the next required sampling event.

2.3.3 Purge Equipment

Ground water wells will be purged with dedicated, permanently installed variable speed submersible pumps. Parts of the pump contacting the ground water will be constructed of stainless steel and Teflon. These pumps will remain dedicated to each respective well throughout monitoring unless replacement is necessary due to damage or wear, in which cause repairs will be completed or a new pump will be dedicated.

In the event of a pump failure, if repairs cannot be completed during the course of the sampling event, a decontaminated bailer will be utilized to purge ground water samples for that sampling event. The pump unit will be repaired prior to the next sampling event.

2.3.4 Purge Procedures

Prior to purge and immediately after the well cap is removed, a MSA gascope combustible gas indicator or equivalent device will be used to check each monitoring well for the presence of any methane gas prior to well evacuation. See Appendix C.1 – C.4 for calibration and operation procedures.

Once the gascope check is completed, the sample crew will put on clean disposal nitrile gloves and an initial water level will be taken as described in Section 2.3.2.

Standard procedures for ground water monitor well purge is as follows:

1. Start the generator (or other power source), electricity voltage to the converter must always be ± 10% of the specified power supply. Generator should be in the downwind direction from the sample point. Specified power supply.

   BMI/MPI 220 Volts, Single Phase AC (198 – 253V)
   BMI/MPI 115 Volts, Single Phase AC (109 – 126V)

   Check power supply with voltmeter for proper voltage range.

2. Connect converter lead to well head power plug and plug power cord from converter into generator.

3. Check the frequency display on the front of converter. It should read "Ø". If it doesn't, refer to the troubleshooting section in the converter owner's manual.

4. If this is the first time the converter is being used or if it has not been used for more than six (6) months, leave the converter on for at least fifteen (15) minutes before proceeding to step 5.

5. Set the converters speed dial to mid scale or well specific upper historical limit.

6. Start the pump by pressing the start/stop switch into the "START" position.

7. Adjust the pump performance by turning the speed dial ±.

Rate of discharge and volume purged will be checked periodically with a graduated bucket and timer or an in-line device.

2.3.5 *Purge Volume*

Low yield wells will be purged to dryness. Moderate to high yield wells will be purged a minimum of three (3) well volumes and to stabilization of field parameters temperature, conductivity, and pH.

Initial volume of water in the well casing will be calculated as:

Volume (gallons) = $(3.14)(r^2)(h)/231$

Where:

r = Radius of inner casing inside diameter ÷ 2 (in inches)

h = Height of water column in the well (in inches) (equals well total depth minus initial measurement to water level)

Parameter stabilization is defined as:

- Specific Conductivity = ± 10% for three (3) consecutive measurements at approximately five (5) minute increments.
- pH = ± 10% standard pH for three (3) consecutive measurements at approximately five (5) minute increments.
- Temperature = ± 10% for three (3) consecutive measurements at approximately five (5) minute increments.

Check water level after purge is complete.

Monitoring of temperature, pH, conductivity, and turbidity for stabilization will be recorded on each Field Log (see Pages B.1 through B.6).

2.3.6 *Purge Water Management*

On an individual monitor well basis, if purge water is known to be historically contaminated or suspect due to prior monitoring analytical data, the purge water shall be stored in appropriate containers until analytical results are available. After review of these analyses, proper arrangements for disposal or treatment of the water shall be made.

2.3.7 *General Sample Collection Information*

Sampling should take place as soon as purging is complete if the well has sufficient recharge. The time interval between the

completion of well purge and sample collection normally should not exceed twenty-four hours.

2.3.8 Sample Collection Order

Monitoring well sampling at each event shall proceed from the point with the highest water level elevation to those with successively lower elevations unless contamination is known to be present.

If contamination is known to be present, samples will be collected from the least to most contaminated wells, to minimize the potential for any cross-contamination. Samples will be collected and containerized according of the volatility of the requested analyses. A specific collection order is as follows:

- Field Parameters (Temperature – Specific Conductivity – pH – Turbidity)
- Volatile Operations
- Metals
- Inorganics

2.3.9 Sampling Equipment/Procedures

Ground water samples will be collected with dedicated, permanently installed variable speed submersible pumps. Parts of the pump contacting the ground water sample will be constructed of stainless steel and Teflon. These are the same pumps used in well purge and have the ability to achieve low flow rates at approximately 100 ml/min.
In the event of a pump failure, if repairs cannot be completed during the course of the sampling event, a decontamination bailer will be utilized to collect ground water samples for that sampling event. The pump unit will be repaired prior to the next sampling event.

Standard procedures for collecting representative ground water samples after completion of purge is as follows:

a. Reduce flow from pump to approximately 100 ml/minute and flow at this rate for approximately five (5) minutes.
b. Sample field parameters.
c. Sample for volatile organic compounds.
d. Increase flow to a moderate rate (0.2 to 1.0 liters/minute).
e. Sample metals.
f. Sample general water chemistry parameters.

2.3.10 Sample Filtration

Louisiana Department of Environmental Quality Solid Waste Regulations, February, 1993 Appendix C (ii) does not currently allow for field sample filtration prior to laboratory analysis.

2.3.11 Sample Preservation

All samples will be containerized and preserved according to Figure B.7, *Sample Containerization and Preservation of Samples*. In the goal to obtain the most representative sample possible, preserving the sample for transportation and storage to the laboratory is also important.

Methods of preservation are intended to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce the volatility of constituents. Samples requiring refrigeration to four degrees Centigrade will be accomplished by placing the sample containers immediately into coolers containing wet ice or the equivalent and delivering to the analytical laboratory as soon as possible.

2.3.12 Field Measurements

Required field measurements include water levels, total well depth, temperature, pH, specific conductivity, and turbidity. Water level measurement procedures are described in Section 2.3.2. Temperature should be measured immediately after collection of the sample. Specific conductance will be measured prior to pH to avoid any effect on the sample from salts due to the pH probe. See Appendix C for pH/temperature, specific conductivity and turbidity procedures and schedule of calibration of these field instruments. Each of these measurements is important in the documentation of properly collected ground water samples.

All instruments shall be properly calibrated and checked with standards according to the manufacturer's instructions and the standard operating procedures outlined in Appendix C. Any improper operating instruments must be replaced prior to continuing sample collection operations. Back-up instruments will be available with the sample crew.

2.4 Record Keeping

2.4.1 Field Logs

All field notes must be completely and accurately documented to become part of the final report for a monitoring event. All field information will be entered on a standard BFI Field Information Log

(see Figures B.1 through B.6). Included on Figures B.1 through B.6 is an explanation of each requested piece of information and the proper location to enter the data.

At the site, an up-to-date field logbook will be maintained which documents each sample event. An individual field log page is shown on Figure B.1. All entries should be legible and made in black, indelible ink. Entry errors will be crossed out with a single line, dated, and initialed by the person making the corrections.

2.4.2 *Chain-of-Custody*

Proper chain of custody records are required to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including the temperature of the samples at the time of log in. The sample collector shall fill in all applicable sections and forward the original, with the respective sample(s), to the laboratory performing the analysis. Upon receipt of the samples at the laboratory, the sample coordinator is to complete the chain of custody, make a copy for his/her files, and make the original documents part of the final analytical report (see Figure B.8).

All sample containers will be labeled to prevent misidentification. The following will be indicated on an adhesive label with a waterproof pen:

- Collector's name, date and time of sampling.
- Sample source.
- Sample identification number.
- Sample preservatives.
- Test(s) to be performed on the sample.

If the sample shuttle kit (cooler) does not employ a tamper proof seal, the collector is to date, sign and identify each sample on a tamper proof seal and attach it to each individual sample container and lid.

2.4.3 *Sample Summary Log*

A quick reference summary sheet referred to as a Field Sample Summary Log (see Figures B.9 and B.10) presents a general overview of the field sampling program. This document is to be prepared prior to a specific sampling event and appropriately filled in with sampling dates each day. The field sample summary log shall be included with the final analytical report as part of the field note documentation section.

2.5 Sample Transport

Samples shall be shipped from the field back to the analytical laboratory either by hand delivery or utilizing an overnight courier service. Samples are to be shipped in sealed insulated shipping containers which maintain the samples at approximately 4°C. Standard shipping containers must be a sturdy water-proof design (ice chests are commonly used) equipped with bottle dividers and cushion material to prevent breakage during shipment. The field crew shall contact the laboratory each time samples are sent to identify the samples being sent and the transportation carrier along with the shipping identification number.

3.0 LABORATORY PROCEDURES/PERFORMANCE STANDARDS

3.1 Deliverables (General and Supplemental QA/QC)

3.1.1 General Requirements

For general reporting of quantitative results for Subtitle D groundwater monitoring projects, the following reporting requirements apply:

- Methodology Summary – a table will be required listing all the analytical test methods used in the analyses of the samples with a reference made for each to the method manual and the test method number to confirm compliance with Appendix A, Table 1.
- Summary of analytical results, indicating appropriate unit, and reporting PQL, and supervisor approval – concentrations units must be consistently applied throughout report. Data cannot be method blank corrected. It must be appropriately flagged.
- Chain-of-Custody Form – a separate form for each sample is not required. Name and organization of person taking sample, time and date of sampling, all custody changes, and all appropriate signatures must be included. All entries must be legible.
- BFI Field Information Logs (see Figures B.1 through B.2).

3.1.2 Supplemental QA/QC Reporting Requirements

- Laboratory Chronicles – must include date of sampling, sample receipt, preservation, preparation, analysis, supervisor approval signature.

- The document should be bound and paginated and shall contain a table of contents; set margins and binding appropriately so that the document is legible.

- Non-Conformance Summary for GC/MS Data Reports – must state if the following do not meet QA/QC requirements:

    - GC/MS Tune Specifications
    - GC/MS Tune Frequency
    - Calibration Frequency
    - Calibration Requirements – System Performance Check
    - Compounds, Calibration Check Compounds
    - Blank Contamination
    - Surrogate Recoveries
    - Sample Holding Times
    - Minimum Detection Limits

3.1.3 Requirements for Organics: Volatiles

1. GC/MS Tune Summary.

2. Calibration Time and Date Summary (Initial and Continuing).

3. Quality Assurance (QA) Data Form – must include minimum detection limits, method blanks, field/trip blanks if specified in Sampling Plan, lab replicate. All blanks and replicates must be run once per batch, or once per 20 samples, whichever is more frequent. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix. A single QA Data Form should be used for a number of samples, however, pertinent sample numbers must be listed on the form.

4. Surrogate Compound Recovery Summary – for samples and blanks – as per most recent version of applicable SW-846 method 8260.

5. Total Ion Chromatogram (TIC) for sample with all peaks identified.

3.1.4 Requirements for Metals

At a minimum, analytical results, method detection limits must be established and method blank results are mandatory.

3.1.5 Requirements for Inorganics – General Chemistry

Quality Assurance (QA) Data Form – must include minimum detection limits, method blanks, field/trip blanks as specified in Sampling Plan, lab replicate. All blanks and replicates must be run once per batch, or once per 20 samples, whichever is more frequent. Quality Control (QC) samples may be other than project samples, but must be of same batch and similar matrix.

A single QA Data Form should be used for a number of samples, however, pertinent sample numbers must be listed on the form. In addition, spiked sample results must be included.

3.2 Data Quality Objectives

3.2.2 Required Reporting Limits

Data reported must be such that the method used shall achieve the nominal practical quantitation limits (PQLs) listed in Appendix A, Table 1. This table is located in Appendix A (Figures A.1 – A.3). Appendix A, Table 1 – Background/Detection Monitoring Parameters (Figures A.1 – A.3)

Method Approaches listed in Appendix A, Table 1 are consistent with the list of suggested methods published in Appendix II of the 40 Code of Federal Regulations (CFR) Part 258, and applicable section of the Louisiana Solid Waste Rules and Regulations (LAC 33:VII).

3.2.3 Precision

Precision refers to the reproducibility of method results when a second aliquot of the same sample undergoes duplicate analysis. The degree of agreement is expressed as the Relative Percent Difference (RPD). The RPD is calculated according to the following equation:

$$\frac{RPD = (D1 - D2) \times 100}{D1 + D2) / 2}$$

Where D1 = result of first sample

D2 = result of second sample (duplicate)

Duplicates shall be run on five percent (5%) of all samples minimally. Minimum requirements for method precision are found in Table 2 (see Figure A.4 in Appendix A).

3.2.4 *Accuracy*

Accuracy refers to the agreement between the amount of a constituent measured by a test method and the amount actually known to be present. Accuracy is usually expressed as a percent Recovery (R). Recoveries will be calculated according to the following equations:

$$\text{Surrogate Spike Recovery} = \frac{SurrR \times 100}{SurrA}$$

where SurrR = amount of surrogate found

and SurrA = amount of surrogate added

$$\text{Matrix Spike Recovery} = \frac{(MSR - SR) \times 100}{SA}$$

Where MSR = Matrix Spiked Sample Result

SR = Sample Result

SA = Spike Added

Laboratory Control Sample Recovery = LCS Found x 100 / LCS True

Recommended surrogate standards must be added to each organic sample processed to monitor method performance. Spikes and/or Laboratory Control Samples are to be run of at least five percent (5%) of samples run. Minimum requirements for method accuracy are listed in Table 3 (see Figure A.4 in Appendix A). Surrogate Recovery limits are generally published in the applicable method.

3.2.5 *Completeness*

Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. Projects shall meet a level of ninety percent (90%) completeness. A corrective action narrative may be required from a laboratory should a project completeness fall below ninety percent (90%).

$$\text{Completeness} = \%C = 100 \times V / N$$

where V = Number of measurements judged valid

N = Total number of measurements

3.3 Approved Analytical Methods

Methods and reporting limits will conform to Appendix A, Table 1.

4.0 SAMPLING FREQUENCY – DETECTION MONITORING

4.1 Background

Per LAC 33:VII.709.E.3.g, BFI Colonial Landfill will monitor for the list of parameters in LAC 33:VII Appendix C Table 1. These parameters are listed with appropriate individual methodology and reporting limits in Appendix A, Table 1.

As stated in LAC 33:VII.709.E.2.e.i., the number of samples to be collected to establish ground water quality data shall be consistent with the appropriate statistical procedures determined pursuant to LAC 33:VII.709.E.2.e.ii. Guidance listed in the LDEQ Solid Waste Division *Groundwater Regulatory Interpretation Document*, September 9, 1994, require four (4) samples to be collected quarterly over a period of one year to reflect seasonal variations in ground water quality. In addition, this guidance document advises some statistical methods require more than four (4) independent samples for the statistical method to be valid. Due to the seasonal and temporal variations natural in ground water analytical data and the distinctive change in Municipal Solid Waste (MSWL) ground water monitoring requirements in the State of Louisiana, eight (8) independent samples from each upgradient and background well shall be collected and analyzed for the constituents in Appendix A, Table 1 (LAC 33:VII Appendix C Table 1).

4.2 Detection Monitoring Events

The detection monitoring program consists of 11 Zone 2 wells and 11 Zone 3 wells located on the perimeter of the landfill. Also, two wells in the interior of the landfill and five piezometers provide additional groundwater elevation data. A list of monitor wells and monitor well information is presented in Table 1. The locations of the wells are shown on Figure 1.

After establishment of background values, sampling and analysis for both upgradient and downgradient detection monitoring wells will be conducted on a semi-annual basis (every six (6) months) for constituents listed in Appendix A, Table 1.

4.3 Groundwater Analysis Result Submittals

Four (4) bound copies, measuring 8.5 inches by 11 inches, of a report of all ground water sampling results will be submitted no later than 90 days after each sampling event. The report will be submitted on forms provided

by the administrative authority and shall include at a minimum the following:

a. Documentation of the chain of custody of all sampling and analyses;

b. Scaled potentiometric surface map(s) showing monitoring well locations and ground water elevations with respect to mean sea level (msl) for each stratum monitored;

c. Isopleth map for each well of all parameters or constituents or plots by well of concentration of parameters or constituents versus time;

d. For the initial sampling event only, a boring log for each well showing the screened interval and ground surface elevation with respect to mean sea level (msl); and

e. A statement of whether a statistically significant difference in concentration over background concentrations is detected.

5.0 STATISTICAL METHODOLOGY GROUND WATER DATA ANALYSIS

The groundwater chemistry data will be evaluated to determine if there has been a statistically significant increase (SSI) for each of the constituents monitored. Analyses will be in accordance with LAC 33:VII.709. Statistical analyses will be performed using Sanitas®, (IDT, 1999) a commercial software program developed by Intelligent Decision Technologies, Inc. or another comparable computer program.

The statistical analysis procedures have been prepared using generally accepted statistical analysis principles and practices. However, it is not possible to predict all of the potential future circumstances. Therefore, alternative methods that are more appropriate for the data distribution of the constituents being evaluated may be proposed to the Louisiana Department of Environmental Quality (LADEQ) for approval.

If, based on the statistical evaluation, a SSI has occurred for any constituent, BFI will notify the LDEQ within seven (7) days of the determination. Also, resampling will be conducted at that location for the subject parameter. These verification sample results will be analyzed statistically. If the verification sampling result(s) do not indicate a SSI, then no further action is necessary. If the verification sampling result(s) indicate a SSI, then BFI will conduct assessment monitoring. Verification samples will be collected and the results reported to the LDEQ within 90 days after initial determination of a SSI.

If assessment monitoring is warranted, an assessment will be conducted at the monitor wells on each side of the well(s) indicating a SSI. Assessment samples from these wells will be analyzed for LAC 33:VII, Appendix C, Table 2 constituents. Upon receipt of the analytical data from the assessment, BFI will prepare and submit to the LDEQ a report presenting the findings. Based on the

findings of the assessment, a recommendation will be made for no further action, additional assessment, or corrective action. Appropriate justification will be presented if no further action is recommended. If additional assessment or corrective action is recommended, BFI will meet with the LDEQ to discuss the scope of the additional assessment or corrective action. The assessment report will be submitted to the LDEQ within 180 days after the initial determination of a SSI.

6.0 REFERENCES

American Society of Testing and Materials (ASTM), 1986. *Standard Guide for Sampling Groundwater Monitoring Wells.* D 4448 – 850.

Martin, W.F., Lippitt, J.M., and Protherd, T.G., 1987. *Hazardous Waste Handbook For Health and Safety*, Butterworth Publishers, Stoneham, Massachusetts, pp. 28 – 30.

U.S. Environmental Protection Agency, 1986. *RCRA Groundwater Monitoring Technical Enforcement Guidance Document.* OSWER – 9950.1, Office of Waste Programs Enforcement, Office of Solid Waste and Emergency Response, Washington, D.C.

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U.S. Environmental Protection Agency, 1991b. *Handbook - Groundwater, Volume II: Methodology.* EPA/625/6-90/0166.

U.S. Environmental Protection Agency, November 1986. *Test Methods for Evaluating Solid Waste – Physical/Chemical Methods, Third Edition (Revised),* SW-846. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency, November 1993. *Solid Waste Disposal Facility Criteria Technical Manual.* EPA/530-R-93-017, NTIC #PB94-100-450, Office of Solid Waste and Emergency Response, Washington, D.C.

Louisiana Department of Environmental Quality, February, 1993. *Environmental Regulatory Code, VII. Solid Waste Regulations. Second Edition.*

Louisiana Department of Environmental Quality, Solid Waste Division, September 9, 1994. *Groundwater Regulatory Interpretation Document.*

TABLE 1

MONITOR WELL DATA

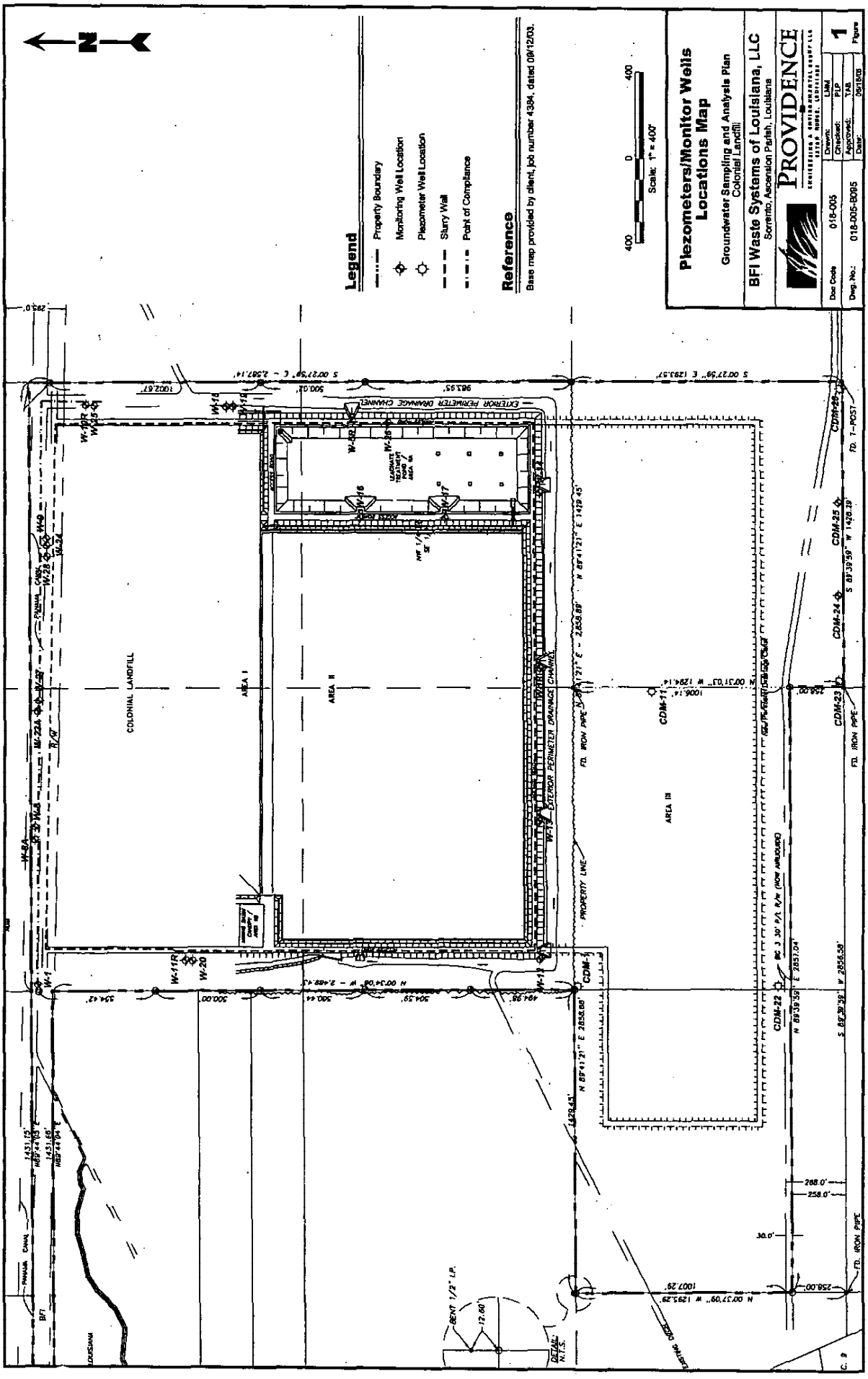
TABLE 1

MONITOR WELL DATA
Groundwater Sampling and Analysis Plan
BFI Waste Systems of Louisiana, LLC, Colonial Landfill, Sorrento, Louisiana

Well Owner #	Well Use	Zone Monitored	Well Depth (MSL)	Screen Interval (MSL)	Top of Casing Elevation (MSL)	Ground Surface Elevation (MSL)	Casing Size (in)	Drill Date	Latitude	Longitude	Up/Down Gradient
W-1	MONITOR	3	-33.80	-23.80--28.80	9.20	6.20	4	Aug-82	30:08:57	-90:51:53	Down
W-5R	MONITOR	2	-32.78	-20.28--30.28	12.10	9.72	4	Nov-92	30:08:43	-90:51:23	Down
W-8	MONITOR	3	-40.22	-30.22--35.22	7.78	4.78	4	May-83	30:08:50	-90:58:36	Down
W-8A	MONITOR	3	-42.10	-29.10--39.10	7.95	4.95	4	May-89	30:08:57	-90:51:44	Down
W-9	MONITOR	2	-33.80	-23.80--28.80	7.48	4.48	4	May-83	30:08:39	-90:58:27	Down
W-10R	MONITOR	2	-31.35	-18.85--28.85	10.99	8.65	4	Nov-92	30:08:55	-90:51:22	Down
W-11R	MONITOR	2	-37.14	-24.64--34.64	10.07	7.86	4	Dec-92	30:08:50	-90:51:52	Up
W-12	MONITOR	3	-48.31	-40.81--45.81	11.88	9.19	4	Oct-92	30:08:34	-90:51:52	Up
W-13	MONITOR	2	-33.82	-26.32--31.32	11.28	8.68	4	Nov-92	30:08:34	-90:51:44	Up
W-14	MONITOR	2	-27.57	-20.07--25.07	12.26	9.93	4	Nov-92	30:08:34	-90:51:26	Up
W-15	MONITOR	2	-31.14	-18.64--28.64	11.63	8.86	4	Nov-92	30:08:50	-90:51:22	Down
W-18	MONITOR	2	-33.78	-26.28--31.28	11.16	8.72	4	Nov-92	30:08:34	-90:51:36	Up
W-19	MONITOR	3	-43.60	-36.10--41.10	11.63	8.90	4	Nov-92	30:08:50	-90:51:22	Down
W-20	MONITOR	3	-52.13	-39.63--49.63	10.35	7.87	4	Dec-92	30:08:50	-90:51:52	Up
MW-23A	MONITOR	3	-39.93	-31.91--36.91	10.59	8.09	4	Nov-98	30:08:52	-90:58:51	Down
MW-24	MONITOR	3	-40.30	-31.52--36.52	10.98	7.98	4	Aug-98	30:08:54	-90:58:57	Down
MW-25	MONITOR	3	-44.59	-39.09--44.09	10.91	7.91	4	Aug-98	30:08:55	-90:51:22	Down
MW-26	MONITOR	3	-45.65	-38.65--43.65	11.35	8.35	4	Aug-98	30:08:42	-90:51:23	Down
MW-27	MONITOR	2	-26.46	-19.73--24.73	11.27	8.27	4	Aug-98	30:08:57	-90:51:37	Down
MW-28	MONITOR	2	-25.66	-20.16--25.16	10.84	7.84	4	Aug-98	30:08:57	-90:51:29	Down
CDM-24	MONITOR	3	-48.10	-37.60--47.60	6.90	1.90	2	Sept-04	30:08:20	-90:51:21	Up
CDM-25	MONITOR	3	-47.20	-36.70--46.70	7.80	2.80	2	Sept-04	30:08:20	-90:51:37	Up

FIGURE 1

PIEZOMETERS/MONITOR WELLS LOCATIONS MAP


Legend
Property Boundary
Monitoring Well Location
Piezometer Well Location
Slurry Wall
Point of Compliance
Reference
Base map provided by client, job number 4384, dated 09/12/03.
Scale: 1" = 400'
Piezometers/Monitor Wells Locations Map
Groundwater Sampling and Analysis Plan
Colonial Landfill
BFI Waste Systems of Louisiana, LLC
Sorrento, Ascension Parish, Louisiana
PROVIDENCE
Doc Code 018-005
Dwg. No.: 018-005-B085
Drawn: LMW
Checked: PLP
Approved: TAB
Date: 09/18/03
Figure 1
COLONIAL LANDFILL
AREA I
AREA II
AREA III
EXTERIOR PERIMETER DRAINAGE CHANNEL
PROPERTY LINE
FD. IRON PIPE
CDM-22
CDM-23
CDM-24
CDM-25
W-1
W-1R
W-2A
W-9
W-11R
W-12
W-13
W-15
W-15R
W-16
W-17
W-18
W-19
W-20
W-21
W-22A
W-23
W-24
W-28
N 89°41'21" E 2656.88'
S 89°39'59" W 2656.58'
N 89°39'59" E 2657.04'
N 00°34'08" W 2,488.43'
S 00°27'59" E 2,587.14'
S 00°27'59" E 1293.57'
N 00°27'09" W 1293.29'
BENT 1/2" I.P.
12.60'
DETAIL N.T.S.
EXTERIOR PERIMETER DRAINAGE CHANNEL
ROAD
BFI
LOUISIANA

APPENDIX A

TABLE 1
BACKGROUND/DECTECTION MONITORING PARAMETERS[4]

Parameter	CAS RN[1]	Method[2]	PQL[3] (mg/l)
Antimony	(Total)	7041	0.006
Arsenic	(Total)	7060[7]	0.01
Beryllium	(Total)	6010	0.001
Barium	(Total)	6010	0.02
Cadmium	(Total)	7131[7]	0.001
Chromium	(Total)	6010	0.02
Cobalt	(Total)	6010	0.07
Copper	(Total)	6010	0.015
Lead	(Total)	7421[7]	0.01
Nickel	(Total)	6010	0.05
Selenium	(Total)	7740[7]	0.01
Silver	(Total)	6010	0.05
Thallium	(Total)	7841	0.002
Vanadium	(Total)	6010	0.08
Zinc	(Total)	6010	0.02
Acetone	64-64-1	8260	0.010
Acrylonitrile	107-13-1	8260	0.020
Benzene	71-43-2	8260	0.002
Bromochloromethane	74-97-5	8260	0.002
Bromodichloromethane	75-27-4	8260	0.002
Cis-1,3-Dichloropropene	10061-01-5	8260	0.002
trans-1,3-Dichloropropene	10061-02-6	8260	0.002
Ethylbenzene	100-41-4	8260	0.002
Bromoform	75-25-2	8260	0.002
Bromomethane	74-83-9	8260	0.002
2-Butanone(MEK)	78-93-3	8260	0.010
Carbon Disulfide	75-16-0	8260	0.002

TABLE 1

BACKGROUND/DECTECTION MONITORING PARAMETERS[4]

Parameter	CAS RN[1]	Method[2]	PQL[3] (mg/l)
Carbon Tetrachloride	66-23-5	8260	0.002
Chlorobenzene	108-90-7	8260	0.002
Chlorodibromomethane	124-48-1	8260	0.002
Chloroethane	75-00-3	8260	0.002
Chloroform	67-66-3	8260	0.002
Chloromethane	74-87-3	8260	0.002
1,2-Dibromo-3-chloropropane	96-12-8	8260	0.002
Dibromomethane	74-95-3	8260	0.002
1,2-Dibromoethane	106-93-4	8260	0.002
trans-1,4-Dichloro-2-butene	110-57-6	8260	0.020
1,2-Dichlorobenzene	95-50-1	8260	0.002
1,4-Dichlorobenzene	106-46-7	8260	0.002
1,1-Dichloroethane	75-34-3	8260	0.002
Cis-1,2-Dichloroethene	156-59-2	8260	0.002
trans-1,2-Dichloroethene	156-61-5	8260	0.002
1,1-Dichloroethene	75-35-4	8260	0.002
1,2-Dichloroethane	107-06-2	8260	0.002
1,2-Dichloropropane	78-87-5	8260	0.002
2-Hexanone	591-78-6	8260	0.005
Iodomethane	74-88-4	8260	0.002
Methylene Chloride	75-09-2	8260	0.002
4-Methyl-2-pentanone	108-10-1	8260	0.002
Styrene	100-42-5	8260	0.002
1,1,1,2-Tetrachloroethane	630-20-6	8260	0.002
1,1,2,2-Tetrachloroethane	79-34-5	8260	0.002
Tetrachloroethene	127-18-4	8260	0.002

TABLE 1

BACKGROUND/DECTECTION MONITORING PARAMETERS[4]

Parameter	CAS RN[1]	Method[2]	PQL[3] (mg/l)
Toluene	108-88-3	8260	0.002
1,1,1-Trichloroethane	71-55-6	8260	0.002
1,1,2-Trichloeoethane	79-00-5	8260	0.002
Trichloroethene	79-01-6	8260	0.002
Trichlorofluoromethane	75-69-4	8260	0.002
1,2,3-Trichloropropane	96-18-4	8260	0.002
Vinyl acetate	108-08-4	8260	0.010
Vinyl Chloride	78-01-4	8260	0.002
Xylene (Total)	1330-20-7 See note 6	8260	0.002

Reference notes may be found at the end of the last table on Figure A.5.

TABLE 2

MINIMUM PRECISION REQUIREMENTS
REPORTED AS RELATIVE PERCENT DIFFERENCE (RPD)

FRACTION	PARAMETER	WATER	SOIL/SEDIMENT
Volatile Organics by GC/MS - Method 8260			
VOA	1,1-Dichloroethene	20	22
VOA	Trichloroethene	20	24
VOA	Chlorobenzene	20	21
VOA	Toluene	20	21
VOA	Benzene	20	21
Inorganics			
	Metals	20	20
	Cyanides	20	20
	Wet Chemistries	25	25

TABLE 3

MINIMUM ACCURACY LIMITS

FRACTION	PARAMETER	WATER	SOIL/SEDIMENT
Volatile Organics by GC/MS - Method 8260			
VOA	1,1-Dichloroethene	61-145	59-172
VOA	Trichloroethene	71-120	62-137
VOA	Chlorobenzene	75-130	60-133
VOA	Toluene	76-125	59-139
VOA	Benzene	76-127	66-142
Inorganics			
	Metals	75-125	75-125
	Cyanides	75-125	75-125
	Wet Chemistries	75-125	75-125

NOTES TO TABLE 1

1 Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included. CAS index numbers are those used in the 9th Collective Index.

2 Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", third edition, November 1986, as revised, December 1987, or applicable updates. Analytical details can be found in SW-846 and in documentation on file at the agency.

3 Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in groundwater that can be reliably determined with specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally stated to one significant figure. PQLs are based on 5-ml sample purge for volatile organics.

4 LAC 33:VII Appendix C Table 1 Parameters.

5 EPA Manual 600/4-79-020, "Methods for Chemical Analysis of Water and Waste".

6 Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes (CAS RN 1130-20-7). PWLs for method 8021 are 0.2 for o-xylene and 0.1 for m- or p-xylene. The PQL for m-xylene is 2.0 µg/L by method 8020 or 8260.

7 Alternative trace ICP analysis acceptable if QA/QC meets listed PQL requirements.

APPENDIX B

BFI FIELD INFORMATION LOG

Facility: _____ **Sample Point ID:** _____

Location: _____ **Field Representative:** _____

Sample Matrix: _____ **Lab Sample #:** _____

Gascope Calibration: % Gas: _____ % LEL: _____
Gascope Reading: : % Gas: _____ % LEL: _____

PURGE INFORMATION:

Method of Well Purge: _____ Dedicated: Y / N

Date / Time Initiated: _____ One (1) Casing Volume, Gal: _____

Initial Water Level, Feet: _____ Total Volume Purged, Gal: _____

Ground Water Elevation, MSL: _____ Was Well Purged to Dryness: _____

Well Total Depth, Feet: _____ Water Level After Purge, Feet: _____

Casing Diameter, Inches: _____ Date / Time Completed: _____

PURGE DATA:

Time	Purge Rate (gpm/htz)	Cumulative Volume	Temp. (°C)	pH (Std units)	Conduct. (µmhos/cm)	Turb. (ntu)	Other _____ (___)

PAGE 1 OF 2

BFI FIELD INFORMATION LOG (continued)

SAMPLING INFORMATION: _____ **Sample Point ID:** _____

Method of Sampling: _____ Dedicated: Y / N

Water Level @ Sampling, Feet: _____ Well Collection Sequence Number: _____

Parameters: Annual ( ) Semi-Annual ( ) Quarterly ( ) Monthly ( ) Other ( ) _____

SAMPLING DATA:

Date/Time	Sample Rate	Temp. (°C)	pH (Std. Units)	Conduct. (µmhos/cm)	Turb. (NTU)	Other _____ ( )
	VOA _____ Other _____					

INSTRUMENT CHECK DATA:

Turbidity Serial #: _____ ___NTU std. = _____NTU _____NTU std. = ____ NTU

pH Serial #: _____ 4.0 std. = _____ 7.0 std = _____ 10.0 std. = _____

Conductivity Serial #: _____ ___ µmhos/cm = _____ _____ µmhos/cm =____

GENERAL INFORMATION:

Weather Conditions @ time of sampling: _____

Sample Characteristics: _____

ANALYTE COLLECTION ORDER, CONTAINERS, PRESERVATIVES AND TESTS PERFORMED:

_____

_____

COMMENTS AND OBSERVATIONS:

_____

I certify that sampling procedures were in accordance with all applicable EPA, state and BFI protocols.

Date:__/__/__ By: _____ **Company:** _____

PAGE 2 OF 2

BFI FIELD INFORMATION LOG

Facility: 1 **Sample Point ID:** 4

Location: 2 **Field Representative:** 5

Sample Matrix: 3 **Lab Sample #:** 6

Gascope Calibration: % Gas: 7 % LEL: _____
Gascope Reading: : % Gas: 8 % LEL: _____

PURGE INFORMATION:

Method of Well Purge: 9 Dedicated: Y / N

Date / Time Initiated: 10 One (1) Casing Volume, Gal: 15

Initial Water Level, Feet: 11 Total Volume Purged, Gal: 16

Ground Water Elevation, MSL: 12 Was Well Purged to Dryness: 17

Well Total Depth, Feet: 13 Water Level After Purge, Feet: 18

Casing Diameter, Inches: 14 Date / Time Completed: 19

PURGE DATA:

Time	Purge Rate (gpm/htz)	Cumulative Volume	Temp. (°C)	pH (Std units)	Conduct. (µmhos/cm)	Turb. (ntu)	Other _____ (___)
20	21	22	23	24	25	26	27

PAGE 1 OF 2

BFI FIELD INFORMATION LOG (continued)

SAMPLING INFORMATION: **Sample Point ID:** 4

Method of Sampling: 28 Dedicated: Y / N

Water Level @ Sampling, Feet: 29 Well Collection Sequence Number: 30

Parameters: Annual ( ) Semi-Annual ( ) Quarterly ( ) Monthly ( ) Other ( ) 31

SAMPLING DATA:

Date/Time	Sample Rate	Temp. (°C)	pH (Std. Units)	Conduct. (µmhos/cm)	Turb. (NTU)	Other ____ ( )
32	VOA ____ Other 33	34	35	36	37	38

INSTRUMENT CHECK DATA:

Turbidity Serial #: 39 40 NTU std. = ____NTU ____NTU std. = ____ NTU

pH Serial #: 41 4.0 std. = 42 7.0 std = ____ 10.0 std. = ____

Conductivity Serial #: 43 44 µmhos/cm = ____ ____ µmhos/cm =____

GENERAL INFORMATION:

Weather Conditions @ time of sampling: 45

Sample Characteristics: 46

ANALYTE COLLECTION ORDER, CONTAINERS, PRESERVATIVES AND TESTS PERFORMED:

47

COMMENTS AND OBSERVATIONS:

48

I certify that sampling procedures were in accordance with all applicable EPA, state and BFI protocols.

Date:__/__/__ By: 49 **Company:** ____

PAGE 2 OF 2

BFI FIELD INFORMATION LOG EXPLANATION

1. Name of facility to be sampled.
2. City, County, or Township in which the facility is located.
3. Type of sample collected (ground water, surface water, soil, etc.).
4. The official identification of the sample point (e.g. MW-1).
5. All representatives conducting the purging and/or sampling of the given well.
6. Identification number given to the set of samples. This number is generally assigned by the lab.
7. The gascope calibrations for %Gas and % LEL.
8. The gascope readings for % Gas and % LEL of methane.
9. The equipment used to purge (e.g. Rediflo 2®; QED air displacement purge pump).
10. Self explanatory.
11. Depth to water as measured with a water level indicator from the official point of reference. The official point of reference is usually from top o the inner casing (riser). This is to be included on the laboratory diskette.
12. The actual elevation of the water surface relative to sea level.
13. Measurement from the surveyed point at the top of the inner casing (riser) to the bottom of the well. To be measured to the nearest hundredth of a foot. To be measured every sampling event.
14. Measurement of the inner diameter of the inner casing. To be measured in inches.
15. The volume of water (in gallons) occupying the well prior to purging. Calculation:
    Volume (gallons) = (3.14) $r^2h/231$
    r = radius of the inner casing (in inches)
    h = height of the water column in the well (in inches). Height equals the well total depth minus the initial water level.
    (NOTE: UNITS IN INCHES)
16. The total volume purged form the well prior to sampling. Measured in gallons.
17. Yes or No.
18. Water level measurement taken at the end of purging. If a pump is used for purging, then take the measurement while the pump is on. If a well has been purged to dryness, then write N/A in this space.
19. Self explanatory.
20. Time of a given field data measurement during the purge process. If more than one day is used for purging, then write the new date in the margin next to the time.
21. Timed rate that the well is being purged when the purge field data is being collected. If a rate controlled, electric submersible pump is being used, then also include the Hertz reading on this line.
22. The total volume that has been purged each time the purge stabilization field data is being collected. Measured in gallons.
23. Temperature measured in Celsius to the nearest tenth.
24. pH measured in standard units to the nearest hundredth.
25. Specific conductance measured in micro mhos per centimeter to three (3) or four (4) significant digits.
26. Turbidity measured in nephelometric turbidity units to three (3) significant digits.
27. Any other field parameter measured during the purge process (e.g. dissolved oxygen, eH).

BFI FIELD INFORMATION LOG EXPLANATION

28. Equipment used to sample (e.g. Rediflo21®, Well Wizard® bladder pump). Also indicate if device is dedicated.
29. Measurement of water level from the top of the inner casing measured immediately before sampling.
30. Not sequential number of wells in monitor well sample collection order.
31. Type of parameter list used for the sampling event. If other, then record what is being used.
32. Date and time that sampling begins. Sample field parameters are to be taken separate form purge field parameters. The sample field parameters are to be measured in one (1) replicate unless otherwise stated in state regulations or the site permit.
33. The rate that the sample water is filling the sample bottles (in milliliters per minute).
34. Temperature to be measured only in the field at the time of sampling. Record in degrees Celsius to the nearest tenth.
35. The pH to be written on this line is to be measured only in the field at the time of sampling. Record in standard units to the nearest hundredth.
36. The Specific Conductance to be written on this line is to be measured only in the field at the time of sampling. Record in micro mhos per centimeter to three (3) or four (4) significant digits.
37. The turbidity to be written on this line is to be measured only in the field at the time of sampling. Record in nephelometric turbidity units to three (3) significant units.
38. Any other parameter that is to be measured in the field at the time of sampling.
39. Document turbidity meter manufacturer serial identification number.
40. Turbidity standard to be measured between wells. Record the theoretical standard value in the first line and the measured standard value in the second line. Two (2) different standards can be measured.
41. Document pH meter manufacturer serial identification number.
42. Measure each buffer solution between each well.
43. Document conductivity meter manufacturer serial identification number.
44. Measure each standard solution between each well. Record the theoretical standard solution value in the first line and the measured standard solution value in the second line. Two (2) different standards can be measured.
45. Record any ambient weather conditions that might affect sample.
46. Record general physical characteristics of sample at time of sampling before preservation, filtration, or cooling (e.g. odor, visual turbidity, color, particulate matter).
47. Record the analytes to be tested as per container following the order noted in the sampling section of this SOP. The bottle size and material are also to be recorded along with any preservative. Filtration, if needed, shall also be recorded. Example:
    2 - 40 ml(G)/HCl = VOA
    1 - Liter (P)/Filt. & HNO3 = Diss. Metals.
48. Any comments or observations that reflect anything not covered by this field log that may be important to the sampling event.
49. Record the date signed, the signature of the person who filled out the field log, and the company represented on this line. This line should be filled when the field log has been completed at the well.

CONTAINERIZATION AND PRESERVATION OF SAMPLES

Measurement	Volume, (mL)	Container	Preservative	Max. Holding Times	Reference
Physical Properties					
Specific Cond. (Field)	100	P,G	None	Det. on Site	1
pH (Field	50	P,G	None	Det. on Site	1,2
Temperature (Field)	1000	P,G	None	Det. on Site	1
Turbidity (Field)	100	P,G	None	Det. on Site	1

Measurement	Volume Require (mL)	Container	Preservative	Max. Holding Time	Reference
Metals (except mercury)					
Total	500	P,G	HNO_3 to pH <2	6 Mos	1,2
Dissolved (if applicable)	500	P,G	Filt. + HNO_3 to pH <2	6 Mos	1,2

Measurement	Volume Require (mL)	Container	Preservative	Max. Holding Time	Reference
Organics					
Volatile Organics by GC/MS	100 (2 vials @ 40mL)	G, Teflon septum cap	Cool, 4°C HC1 to pH <2	14 Days	2,3

NOTES:

- Plastic (P) or Glass (G). For metals, polyethylene with an all polypropylene cap is preferred.

REFERENCES:

1 - Methods for Chemical Analysis of Water and Wastes, March, 1983, USEPA, 600/4-79-020 and additions thereto.

2 - Test Methods for Evaluating Solid Waste, Physical/Chemical Method, November, 1966, Third Edition, USEPA, SW-846 and additions thereto.

3 - "Guidelines Establishing Test Procedures for the Analysis of Pollutant Under the Clean Water Act", Environmental Protection Agency, Code of Federal Regulations (CFR), Title 40, Part 136.

BROWNING-FERRIS INDUSTRIES

FIELD SAMPLE SUMMARY LOG

Page ___ of ___

BFI Facility: _____ Location: _____

Laboratory: _____ Sample Dates: _____

Monitoring Event: _____

LAB #	SAMPLE POINT	SAMPLE PARAMETERS/CONTAINER						

Comments: _____

_____

Legend:

•	• Date	• N/R	• INS.

• - Required Sample Parameter
Date - Date of Sample Collection (Date/Month/Year)
N/R - Not Requested
INS. - Insufficient water for Sample
(G) - Glass Container
(P) - Plastic Container

EXAMPLE
BROWNING-FERRIS INDUSTRIES

FIELD SAMPLE SUMMARY LOG

Page 1 of 1

BFI Facility: Colonial Landfill Location: Sorrento, Louisiana

Laboratory: PACE, Inc. Sample Dates: _____

Monitoring Event: Semi-Annual Detection Monitoring

LAB #	SAMPLE POINT	SAMPLE PARAMETERS/CONTAINER						
		VOA	Metals	pH, Cond.				
		2-40 ml(G) Vials	1-Liter(P)	1-500 ml(P)				
0000	MW-1	• 2/14/93	• 2/14/93	• 2/14/93				
0001	Field Duplicate	• 2/14/93	• 2/14/93	• 2/14/93				
0002	Field Blk.	• 2/14/93	• 2/14/93	• 2/14/93				
0003	Trip Blk.	• 2/13/93	• 2/13/93	• 2/13/93				

Comments: _____

Legend:

•	• Date	• N/R	• INS.

• - Required Sample Parameter
Date - Date of Sample Collection (Date/Month/Year)
N/R - Not Requested
INS. - Insufficient water for Sample
(G) - Glass Container
(P) - Plastic Container

BFI GROUNDWATER MONITORING WELL CONDITION REPORT

BFI Facility: _____ **Well ID:** _____ **Date:** _____

Access:
Accessibility: Good _____ Fair _____ Poor _____

Vicinity of well clear of weeds and/or debris: Yes _____ No _____

Remarks: _____

Concrete Pad:
Integrity of Concrete Pad: Good _____ Inadequate _____

Presence of depressions or standing water around well:
Yes _____ No _____

Remarks: _____

Protective Outer Casing: Material = _____

Condition of Protective Casing: Good _____ Damaged _____

Condition of Locking Cap: Good _____ Damaged _____

Condition of Lock: Good _____ Damaged _____

Condition of Weep Hole: Good _____ Damaged _____

Remarks: _____

Well Riser: Material = _____

Condition of Riser: Good _____ Damaged _____

Condition of Riser Cap: Good _____ Damaged _____

Measurement Reference Point: Yes _____ No _____

Remarks: _____

Dedicated Purging/Sampling Device: Type = _____

Condition: Good _____ Damaged _____ Missing: _____

Remarks: _____

Field Certification: _____
Signed Title Date

APPENDIX C

MONITORING OPERATION PROCEDURES

1. Take calibrated meter to monitoring well.
2. Turn meter on and wait for "ready" light (about 4 seconds).
3. Clear meter by holding probe in fresh air and pumping the bulb eight (8) to ten (10) times.
4. Set both scales to zero.
5. Switch RANGE to "GAS".
6. Remove cap from outer casing of probe. Remove cap from monitoring probe. Immediately place extension probe into the monitoring well. Do not leave cap off for more than a few seconds before monitoring.
7. Pump the bulb 5 to 7 times.
8. Watch the indicator needle, and take a reading where the needle peaks. This reading is the percentage of gas. Record it on the BFI Field Information Log.

If percentage of gas is over 5%, methane exceeds LEL limits. 1) Leave well head area immediately. 2) Notify District Compliance Manager. 3) Wait approximately ten (10) minutes for well to "vent" and repeat monitoring operation procedures steps 1 - 8. If percentage of gas is less than 5%, go to step 9.

9. Switch RANGE to "LEL".
10. Pump bulb another three (3) to five (5) times.
11. Watch indicator needle and take a reading where needle peaks.
12. Record the LEL on Data Sheet in BFI Field Information Log

0 - 10% LEL Continue
10 - 25% LEL Continue with Caution
>25% LEL Leave area immediately, wait 5 minutes and repeat

13. Remove extension probe from monitoring well.

14. Clear the meter by pumping fresh air eight (8) to ten (10) times through LEL and chamber, and then eight (8) to ten (10) times through percent gas chamber .

MAINTAINING THE GASCOPE 625

The Gascope needs three (3) kinds of regular maintenance - cleaning, leach checks and flow rate checks.

Cleaning

- Clean case and meter face with a soft cloth dampened with water.

Never purge meter using compressed air.
It may contain oil or water that can damage internal parts.

Leak Checks

- Check for leaks in sampling system
  - Seal inlet fitting with a finger of left hand
  - Squeeze bulb
  - Immediately seal bulb outlet with finger of right hand
  - System is free of leaks if bulb stays deflated
  - Continue checking for leaks if bulb inflates

- Check filament seals
-
  - Open case and tighten both filaments
  - Repeat the leak test described above
  - Continue checking for leaks if bulb still inflates

- Check bulb
  - Seal inlet fitting with one finger
  - Squeeze bulb
  - Replace the bulb if it inflates in less than 6 minutes

Flow Rate Checks

- Test flow rate after checking for leaks. Proper flow rate is 0.03 - 0.05 cubic feet per hour, or 0.8 - 1.4 liters per minute.
- Squeeze bulb. It should inflate completely in 1 -2 seconds.
- Replace cotton filter if bulb doesn't inflate within 2 seconds. Use tweezers to remove inlet fitting gasket and filter.
- Disconnect bulb tubing from outlet fitting.
- Remove flow regulating orifice from fitting and make sure it's open.
- Insert No.23 gauge wire into opening if orifice is clogged.
- Replace bulb and squeeze. If bulb doesn't inflate within 2 seconds, replace flashback arresters. (See Gascope Instruction Manual for directions). Gascope may need factory repair if bulb still doesn't inflate after you've replaced flashback arresters.

pH METER CALIBRATION / OPERATION PROCEDURES
(reference EPA Method 9040)

The field pH meter will calibrated each day water samples are collected. Calibration results will be recorded on the BFI Field Information Log.

pH CALIBRATION

Two-Buffer Calibration

This procedure is recommended for precise measurements.

1. Select two buffers which bracket the expected sample pH. The first should be near the electrode isopotential point (pH 7) and the second near the expected sample pH (e.g. pH 4 or pH 10).

2. Rinse electrode first with distilled water and then with pH 7 buffer. Place the electrode in pH 7 buffer.

3. Wait for stable display. Set the meter to the pH value of the buffer at its measured temperature. (ATC @ 25°C = 7.00)

4. Rinse electrode first with distilled water and then with the second buffer. Place the electrode in the second buffer.

5. When the display is table, set the meter to the actual pH value of the buffer as described in the meter instruction manual.

6. If all steps are performed correctly, and the slope is between 92 and 102%, proceed to **pH Measurement**.

For detailed calibration and temperature compensation procedures, consult meter instruction manual.

pH MEASUREMENT

1. Obtain a neat sample from collection device and place electrode directly into sample.

2. Allow reading to stabilize.

3. Record pH reading directly from meter and record on the BFI Field Information Log.

4. Probes are to be decontaminated by multiple rinses with distilled water.

If any of the above procedures does not work. refer to Troubleshooting section of instrument instruction manual.

Measuring Hints

1. Always use fresh buffers for calibration. Choose buffers that are no more than 3 pH units apart.
2. Check electrode slope daily by performing a two-buffer calibration. Slope should be 92 to 102%.
3. Between measurements, rinse electrodes with distilled water and then with the next solution to be measured.
4. Stir all buffers and samples.
5. Avoid rubbing o(wiping electrode bulb, to reduce chance of error due to polarization.

Interferences

Oil samples and salty samples may leave residues on the electrodes. The probe has to be rinsed thoroughly between all measurements using distilled water to remove salt residues. If oily residues need to be removed, rinse with acetone the distilled water. The electrodes need to be kept wet to ensure proper response.

CONDUCTIVITY / TEMPERATURE METER CALIBRATION / OPERATION PROCEDURES (reference EPA Method 9050)

CALIBRATION PROCEDURES

Conductivity meters are factory calibrated. Most field models cannot be manually calibrated. Conductivity will be checked using commercial traceable standards in the 1000 and 10,000 μmhos/cm range and recorded on the BFI Field Information Log. Calibration checks outside of a ± 10% range are not acceptable. Replace probe and re-check standards. If calibration check standards are still outside ± 10% range, use alternate meter. Do not proceed with sample collection without acceptable calibration checks.

Temperature measurement is also factory calibrated. Temperature will be checked for calibration by comparison prior to sample event with a laboratory thermometer and respond in a ± 10% range.

TEMPERATURE MEASUREMENT

1. Immerse the Conductivity Cell into the sample.
2. Turn Conductivity/Temperature Selector Knob (lower knob, front panel) to temperature readout (labeled "C") mode.
3. Record temperature reading directly from meter and record on the BFI Field Information Log.

CONDUCTIVITY MEASUREMENT

The unit of measure is selected using the Conductivity Range Selector Knob (top knob, front panel) either mS/cm (mmhos/cm) or μS/cm (μmhos/cm). Report all values on the BFI Field Information Log in μmhos/cm (μS/cm).

1. Select Conductivity measurement by turning meter Conductivity/Temperature Selector Knob from OFF to Conductivity (labeled "Δ").
2. Immerse the conductivity cell into the sample.
3. Use the Conductivity Range Selector Knob (top knob, meter front panel) to select the optimum conductivity range for the sample. **Overflow indication ("1") is displayed if range selected is to low.**
4. Record conductivity reading directly from meter and record on the BFI Field Information Log.

5. Probes are to be decontaminated by multiple rinses with distilled water.

Most meters have a fixed temperature coefficient (TC) of 2.1% per °C and a fixed reference temperature of 25°C. These parameters are sufficient for the majority of "natural water" samples.

TURBIDITY METER CALIBRATION / OPERATION PROCEDURES
(reference Standard Methods 180.1)

Turbidity is the physical measurement of light scattered and absorbed verses transmitted through a sample. Turbidity is an indicator of water clarity (the amount of suspended matter found in a sample). Using a nephelometer, the results are expressed a NTU (nephelometer turbidity units).

TURBIDITY MEASUREMENT

1. Collect a representative sample in a clean container. Fill a clean sample cell to the top line, taking care to handle the sample cell by the top only. Cap the cell.

2. Wipe the cell with a soft, lint free cloth to remove water spots and fingerprints.

3. Make sure the instrument is on a flat, steady surface and turn the power on. Select measurement range and turn signal averaging on or off.

4. Place the sample cell in the instrument cell compartment.

5. Press read button.

6. Record turbidity value after lamp icon turns off.

TURBIDITY CALIBRATION

The Hach 2100P Portable Turbidimeter (recommended BFI meter) is calibrated with Formazin Primary Standard at the factory. The recommended recalibration time is once every three (3) months with purchased or prepared Formazin Standard.

Routine Calibration Check with Gelex Standards

The 2100P Turbidimeter does not require standardization before every measurement as some turbidimeters do. Periodically, as experience dictates, check the instrument calibration using the appropriate Gelex Secondary Standard. Be sure the Gelex standards are aligned correctly when inserting them (diamond aligns with orientation mark). If the reading is not within 5% of the previously established value, the instrument should be recalibrated with Formazin Primary Standard (see below).

Quarterly Calibration Procedure

1. Rinse a clean sample cell with dilution (deionized) water and fill to the mark with dilution water.

2. Place cell into cell compartment, align orientation marks, close lid and press 110.

3. Press CAL, the "SO" icons appear and the "O" will flash. Press READ, the instrument will read the blank and calculate a correction factor. If the dilution water is less than or equal to 0.5 NTU, E 1 will appear when the calibration is calculated.

4. The "'S1" display will show the value of the first turbidity standard. Using a clean sample cell, fill with the well mixed portion of 20 NTU standard. Insert the align the sample cell in the cell compartment, close the lid and press READ. When finished, the instrument will automatically move to the next standard.

5. Follow the instructions listed above for a 100 NTU and a 800 NTU standard.

6. Press CAL to accept the calibration, the instrument will return to measurement mode.

7. THIS PROCEDURE IS TO BE PERFORMED IN THE LABORATORY EVERY THREE (3) MONTHS, OR AS NEEDED (if not within ± 5% gelex standard checks).

MAINTENANCE

Keep the turbidimeter and accessories as clean as possible and store the instrument in the carrying case when not in use. Avoid prolonged exposure to sunlight and ultraviolet light. Wipe spills up promptly. Wash sample cells with non-abrasive laboratory detergent, rinse with distilled or demineralized water, and air dry. Avoid scratching the cells and wipe all moisture and fingerprints off the cells before inserting them into the instrument. Failure to do so can give inaccurate readings.

BASIC WATER LEVEL INDICATOR PROCEDURES

The following outlines standard procedure for taking monitor well water levels:

1. Unlock and remove the monitor well protective casing cap. Note and document any problems with the locking cap or lock itself.

2. Put on a pair of clean new disposable gloves and remove the well seal access port from the top of the dedicated pump wellhead assembly. Store the access port in a clean location.

3. Check the on/off button and sensitivity switch with the test button located on the side of the water indicator. A audible beep and light indicate that the device is working properly. The sensitivity switch should be turned to the highest setting and then lowered if required due to highly conductive water (e.g. if the sensitivity is too high the water indicator buzzer will fail to turn off when removed from water column. On the other hand, if the sensitivity is too low the indicator will not detect the water column in a water with low conductivity).

4. Slowly lower the indicator probe into the well until the audible beep/light indicates the probe has contacted the water column. Carefully work the probe up and down to find the exact spot the probe senses the water level.

5. Read the tape measure numbers on the indicator line at the top of well seal access port. These numbers are in 1/100 of a foot increments. Record the measurement to the closest 1/100 of a foot. This number reflects the distance from the top of wellhead seal access port down to the water column. The wellhead seal access port is a permanent surveyed point of reference. To convert this number to water level relative to Mean Sea Level (MSL), subtract the water level measurement from the surveyed elevation of the monitor well wellhead seal access port.

6. As the probe and line are pulled from the well, the line should be wiped with a fresh distilled/deionized saturated paper towel. The probe should then be washed with the non-phosphate detergent and rinsed with triple distilled/deionized rinse.

APPENDIX V

SOIL BENTONITE SLURRY CUTOFF WALL QUALITY ASSURANCE PLAN

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
SORRENTO, LOUISIANA
ASCENSION PARISH

SOIL BENTONITE SLURRY CUTOFF WALL
QUALITY ASSURANCE PLAN

JUNE 2007

Prepared By:

PROVIDENCE

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, LA 70802
(225) 766-7400

Providence Engineering Project No. 018-005-016

TABLE OF CONTENTS

1.0 DESCRIPTION

A slurry wall is constructed around the perimeter of the landfill. The slurry wall consists of a clay-bentonite mixture that has a maximum permeability of $1X10^{-7}$ centimeters per second (cm/sec), and is approximately 3 feet wide with an average depth of 45 feet. The slurry wall surrounding the existing landfill inhibits groundwater movement. The slurry wall, which was installed in 1991, isolates Zone 2 and extends into portions of Zone 3. Interpretation of the hydraulic gradient is a result of extrapolating groundwater contours across the slurry wall; two interior wells provide some basis for extrapolation. A slurry wall will be extended to Area III.

2.0 STANDARDS

Material requirement and test performed on the specified materials will conform to the following standards:

1. American Petroleum Institute (API) Standard Specifications:

- API Specification 13A	Specification for Drilling Fluid Materials
- API Specification 13B-1	Recommended Practice Standard Procedure for Field Testing Water Based Drilling Fluids

2. American Society for Testing Materials (ASTM) Standards:

- ASTM C143	Slump of Portland Cement Concrete
- ASTM D422	Standard Method for Particle Size Analysis of Soils
- ASTM D1140	Materials Finer than 75 UM (no. 200) Sieve in Mineral Aggregates by Washing
- ASTM D4318	Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- ASTM D2216	Moisture Content
- ASTM D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter

3.0 CONSTRUCTION QUALITY CONTROL

A. Initial Bentonite Slurry

The bentonite slurry will consist of a stable hydrated homogeneous colloidal suspension of bentonite in water. The properties of the slurry used in all construction sequences will be controlled in accordance with API publication RP 13B-1 and RP 13B-2, "Standard Procedures for Field Testing Drilling Fluids", 12th Edition, and will conform to the requirements stated below:

1. Minimum of 6% bentonite in slurry.

2. The slurry mixture will achieve a minimum unit weight of 63.5 pounds per cubic foot using a mud balance. Slurry unit weight at the batch plant will be measured two times per shift.

3. The viscosity will not be less than 35 seconds as measured by a Marsh funnel. The viscosity of the slurry at the batch plant will be measured two times per shift.

4. The filtrate loss will not exceed 25 or greater than cubic cc at 100 pounds per square inch (psi) in 30 minutes as measured by a filter press. The slurry's filtrate loss will be measured two times per shift.

5. The pH of the bentonite slurry will not exceed 10.0 and will not be under 7. The pH will be tested a minimum of two times per shift utilizing pH strips or a waterproof instrument.

B. Slurry in the Trench

The slurry in the trench will also maintain the same minimum properties as those specified for the initial slurry until after initial excavation, at which time the minimum unit weight is to be maintained at a minimum of 73 pounds per cubic feet (pcf), but not greater than 90 pcf. The viscosity of the trench slurry will be maintained to pass through a Marsh funnel. This will be tested a minimum of two times per shift, with test samples being taken from the toe of backfill and at the point of excavation. Additionally, the slurry's unit weight will be at least 15 pcf less than soil-bentonite backfill density.

Slurry sampling will be conducted utilizing a polyvinyl chloride (PVC) tube, that is open at both ends. This device shuts at its bottom by a rubber ball upon retrieval of the tap measure that suspends the ball, thus allowing the slurry to fill the tube at the desired depth of sampling.

The bentonite slurry will consist of a stable hydrated homogeneous colloidal suspension of bentonite in water. The properties of the slurry used in all construction sequences will be controlled in accordance with API publication

RP 13B-1 and RP 13B-2, "Standard Procedures for Field Testing Drilling Fluids", 12th Edition, and will conform to the requirements stated below:

1. The slurry mixture will achieve a minimum unit weight of 63.5 pcf using a mud balance initially and will achieve a minimum weight of 73 pcf after initial excavation is completed to suspend additional solids, thus increasing the weight of the slurry. Slurry unit weight at the trench will be measured two times per shift.

2. The viscosity will not be less than 40 seconds as measured by a Marsh funnel and will be maintained to pass through a Marsh funnel. The viscosity of the slurry at the trench will be measured two times per shift.

3. The pH of the bentonite slurry will not exceed 10.0 and will not be under 7. The pH will be tested a minimum of two times per shift utilizing pH strips or a waterproof instrument.

C. Soil-Bentonite Prior to Placement in the Trench

The soil-bentonite mixture will also maintain a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec when measured in accordance with ASTM D5084. BFI-Colonial will perform field gradations to determine the amount of fines within the prepared backfill mixture in accordance with ASTM D 1140.

The following tests will be performed onsite prior to introducing backfill back into the excavated trench to ensure material consistency:

Test	Frequency
• Slump ASTM D 143	1 per 250 Cubic Yards
• Density ASTM D 4380 or API 13B-1	1 per 250 Cubic Yards
• Permeability Testing ASTM 5084 (Third Party-Offsite)	1 per 1,000 Cubic Yards
• Gradation ASTM D 1140	1 per 1,000 Cubic Yards

D. Key and Depth Measurement

Trench depths will be measured every 10 feet to within 0.5 feet utilizing a weighted cloth tape. Top of Key is to be determined by the examination of bucket cuttings by the designated BFI-Colonial representative. The Top of Key

is to be confirmed and recorded by BFI-Colonial's Quality Control Representative and samples will be collected from each cut and stored in a sealed container (plastic bag) at a location designated by BFI-Colonial.

Once the Top of Key has been determined, the excavation will be advanced three feet into the underlying formation to the final trench excavation and recorded. In addition, the key elevations will be compared to the work platform elevations and depth of the "cut" of excavation to provide additional information of actual key locations.

Temporary benchmarks (TBM) are to be placed around the slurry wall alignment at 400-foot intervals. These TBMs will be used to determine the work platform elevation. Depth measurements of the top of key elevations deducted from the work platform elevation will provide additional key elevation and will be compared with profiles previously provided from the past site investigations.

Quality control testing along with depth measurements will be recorded on the attached report and submitted the following day to the BFI-Colonial's representative. Verbal test results of current activities such as the slurry wall will be provided to the engineer immediately.

E. Trench Cleaning

Upon achieving the required trench depth, the trench bottom will then be cleaned of excessive sediment by dragging the hydraulic excavators' bucket across the bottom of the trench upon completing each trench "cut". Soundings will be performed after cleaning of the trench has taken place. Additional soundings will be done should backfill operation be suspended for more than two (2) hours. Should the soundings indicate a difference of more than six inches to those previously taken, trench cleaning will be done again prior to additional backfill placement.

F. Documentation

Daily Quality Control test results are to be recorded and submitted to the BFI-Colonial's Representative on the following working day for review and signature indicating general compliance. Such reports are to be available to the BFI-Colonial representative at all times during the project. Copies of reports/testing activities are to be submitted daily to the BFI-Colonial's Representative.

G. Calibration of Quality Control Equipment

BFI-Colonial Quality Control Representative will periodically calibrate the equipment required to perform field testing. Calibrations will include the following:

- Calibrate pH meter with a 7.0 solution as per manufacturer's recommendations. (Not required should pH strips be used.)

- Calibrate mud balance with water (weight of water = 2.4 pcf or 1.00 specific gravity (sg), weights are to be added as necessary to end of balance for calibration.

- Calibrate scale prior to use by using adjusting screw to zero scale.

H. Emergency Action

BFI-Colonial will maintain slurry level throughout the duration of the project. Bentonite slurry is to be stored onsite in the slurry reservoir/pond/tank, should slurry levels fall beyond acceptable levels. In the event of a slurry loss, the slurry level will be raised.

I. Corrective Action

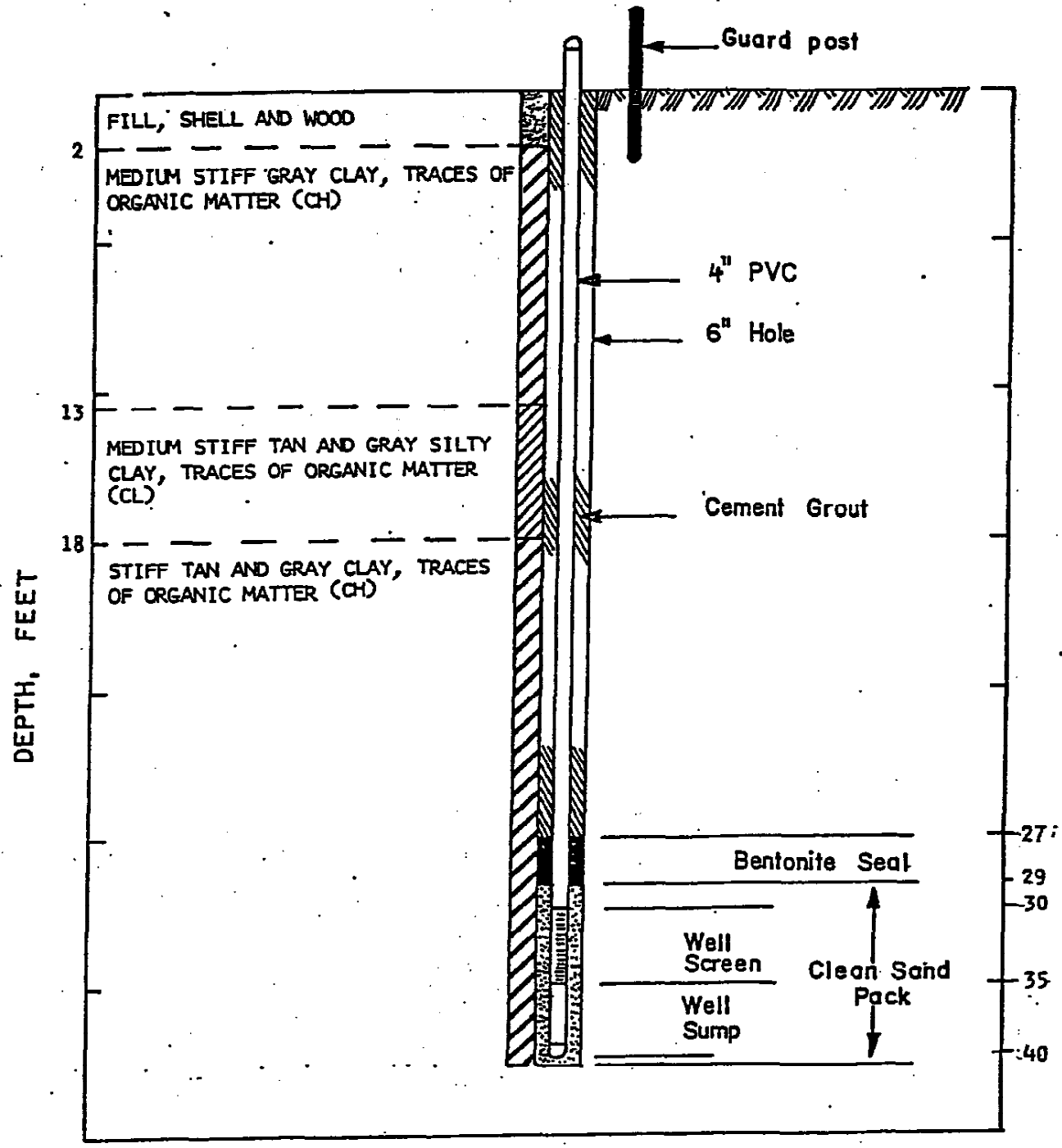
During the progress of work, conditions may exist that require corrective action. To control these situations and provide an opportunity for the responsible parties to contribute to the solution, a Corrective Action Plan will be implemented. Conditions requiring corrective action will be identified, documented, and submitted by the assigned responsible party. Once corrective action is complete, verification that the discrepant conditions have been corrected will be made.

STANDARD QUALITY CONTROL SOIL-BENTONITE SLURRY TRENCH CONSTRUCTION					
SUBJECT	**ITEM**	**STANDARD**	**TEST METHOD**	**MINIMUM FREQUENCY**	**SPECIFIED VALUES**
MATERIALS					
	WATER	EPA 600 OR API 13B-1	- pH - Hardness - TDS	Once every month	5.5 ≤ pH <10 ≤ 300 mg/L ≤ 500 mg/L
	BENTONITE	API 13A	- SECTION 4	One per truckload or rail car	Premium grade, sodium cation bentonite
	IMPORTED SOILS	ASTM D 422	- GRAIN SIZE	One per 250 cubic yards	3 inch – 100% passing No. 40 – 95-100% passing No. 200 – 40-100% passing
SLURRY					
	BATCH PLANT	API 13B-1 ASTM D 4380 (or API 13B-1) API 13B-1 API 13B-1	- VISCOSITY - DENSITY - pH - FILTRATE LOSS	Two per shift Two per shift Two per shift Two per shift	MFV ≥ 35 sec Density ≥ 63.5 pcf 7 ≤ pH ≤ 10 Filtrate 25 cc
	IN TRENCH	ASTM D 4380 (or API 13B-1) API 13B-1	- DENSITY - VISCOSITY - pH	Two per shift Two per shift Two per shift	73 pcf ≥ Density ≤ 90 pcf Pass through Marsh Funnel 7 ≤ pH ≤ 10
SB BACKFILL					
	ONSITE LAB	ASTM C 143 ASTM D 422 ASTM D 2216 ASTM D 4380 (or API 13B-1)	- SLUMP - GRAIN SIZE (-200) - DENSITY	One per every 250 CY One per every 250 CY Two per shift	4 to 6 inches Min. 40% passing + 15 pcf > trench slurry
	THIRD PARTY OFFSITE LAB	ASTM D 5084 ASTM D 422	- PERMEABILITY - GRADATION	One per 1000 Cubic Yards	K ≤ 1 x 10^{-7} cm/sec

APPENDIX W

MONITORING WELL CROSS SECTIONS

MONITORING WELL



Boring No. B-1
Well No. W-1

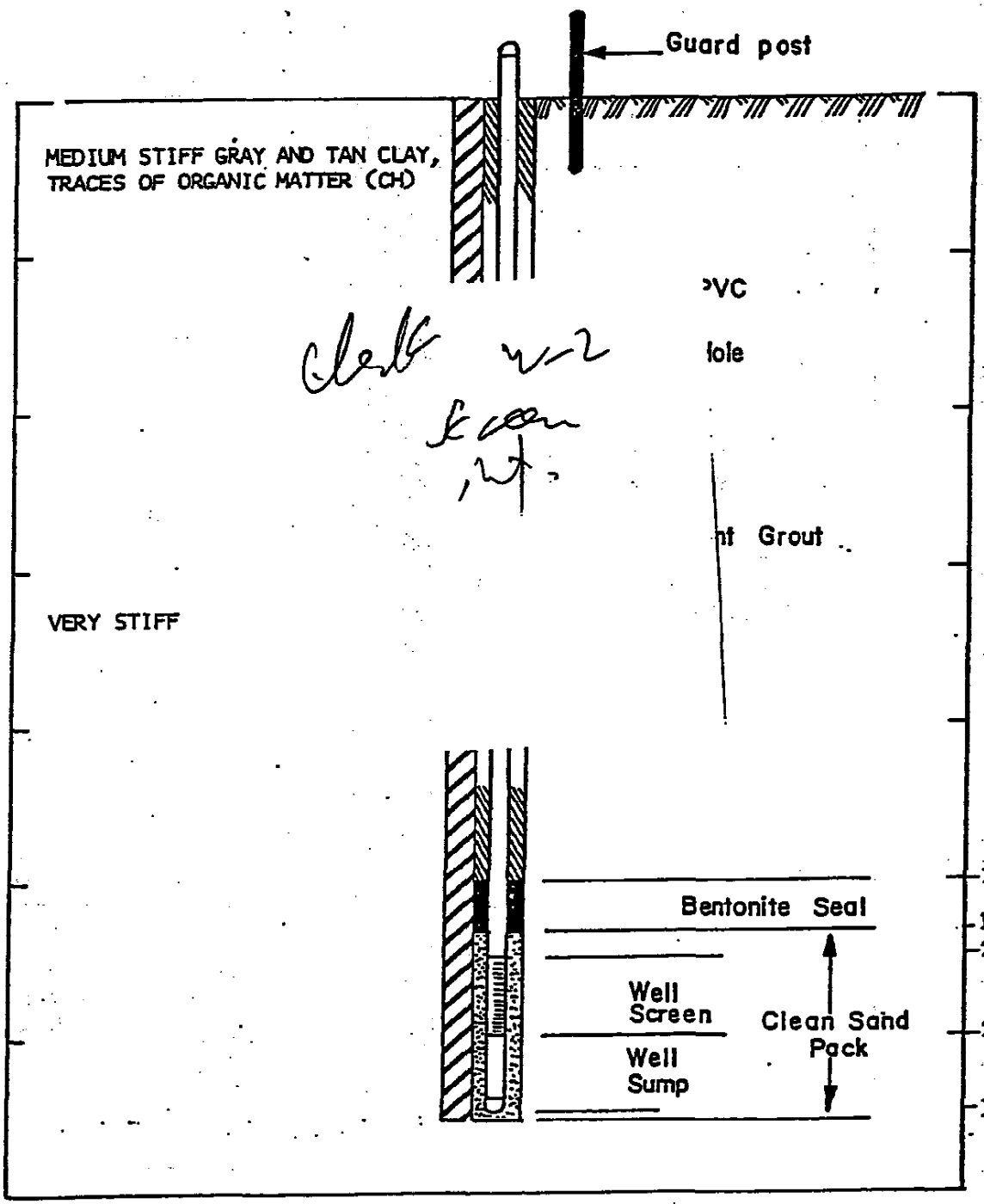
COLONIAL LANDFILL
SORRENTO, LOUISIANA

Drawn by			Proj No. 82-530
Engineer	ASR	11/29/82	

GID

Gulf Drilling Co., Inc.
Geotechnical Investigations

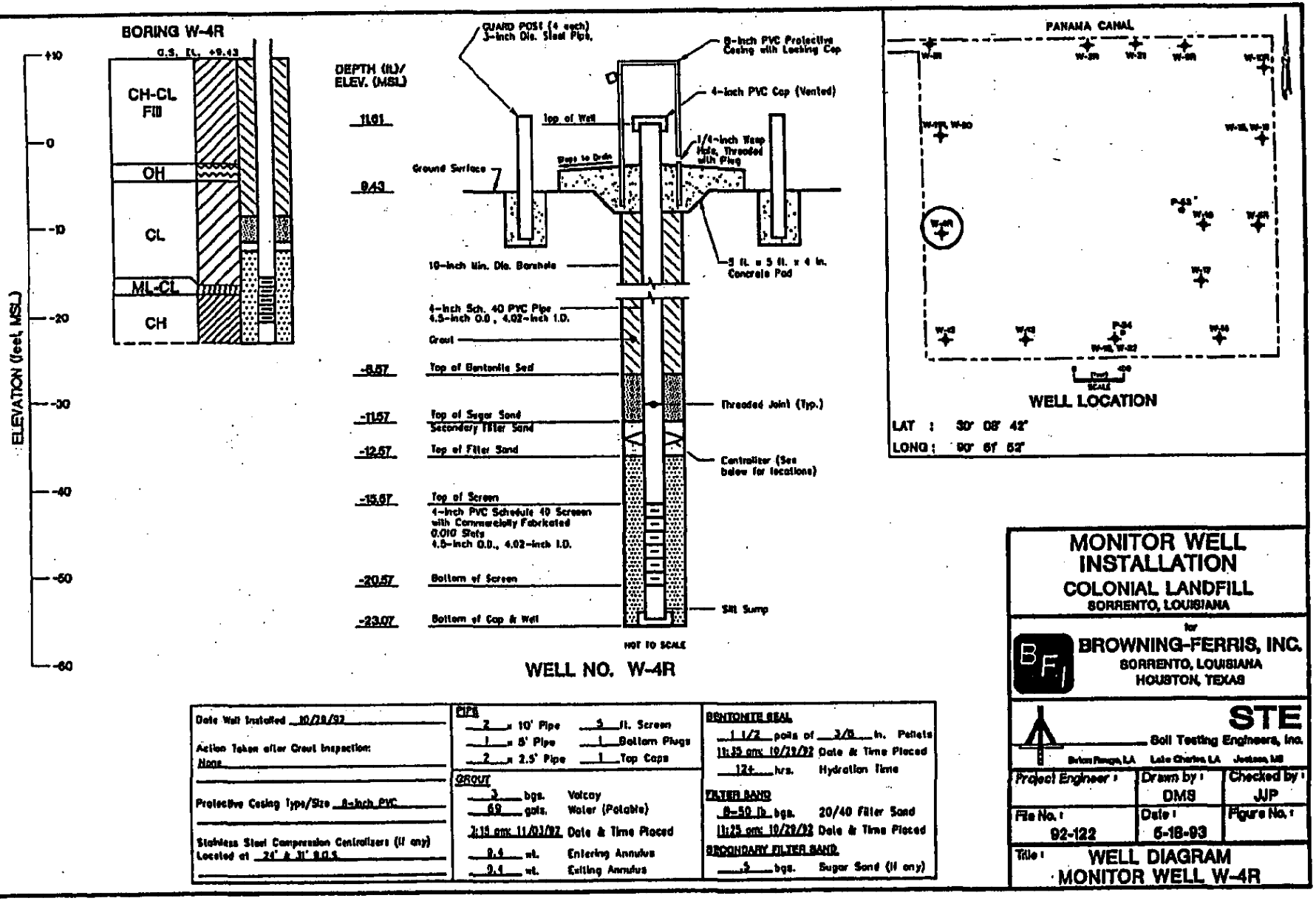
MONITORING WELL



Boring No. B-2
Well No. W-2

COLONIAL LANDFILL
SORRENTO, LOUISIANA

Drawn by			Proj No. 82-530	GID Gulf Drilling Co., Inc. Geotechnical Investigations
Engineer	[illegible]	11/29/82		



Date Well Installed 10/28/92

Action Taken after Grout Inspection: None

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 24' & 31' B.G.S.

PIPE
2 x 10' Pipe — 5 ft. Screen
1 x 5' Pipe — 1 Bottom Plugs
2 x 2.5' Pipe — 1 Top Caps

GROUT
3 bgs. Volcay
69 gals. Water (Potable)
3:15 pm: 11/03/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL
1 1/2 pails of 3/8 in. Pellets
11:35 am: 10/29/92 Date & Time Placed
12± hrs. Hydration Time

FILTER SAND
8-50 lb bgs. 20/40 Filter Sand
11:25 am: 10/29/92 Date & Time Placed

SECONDARY FILTER SAND
3 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

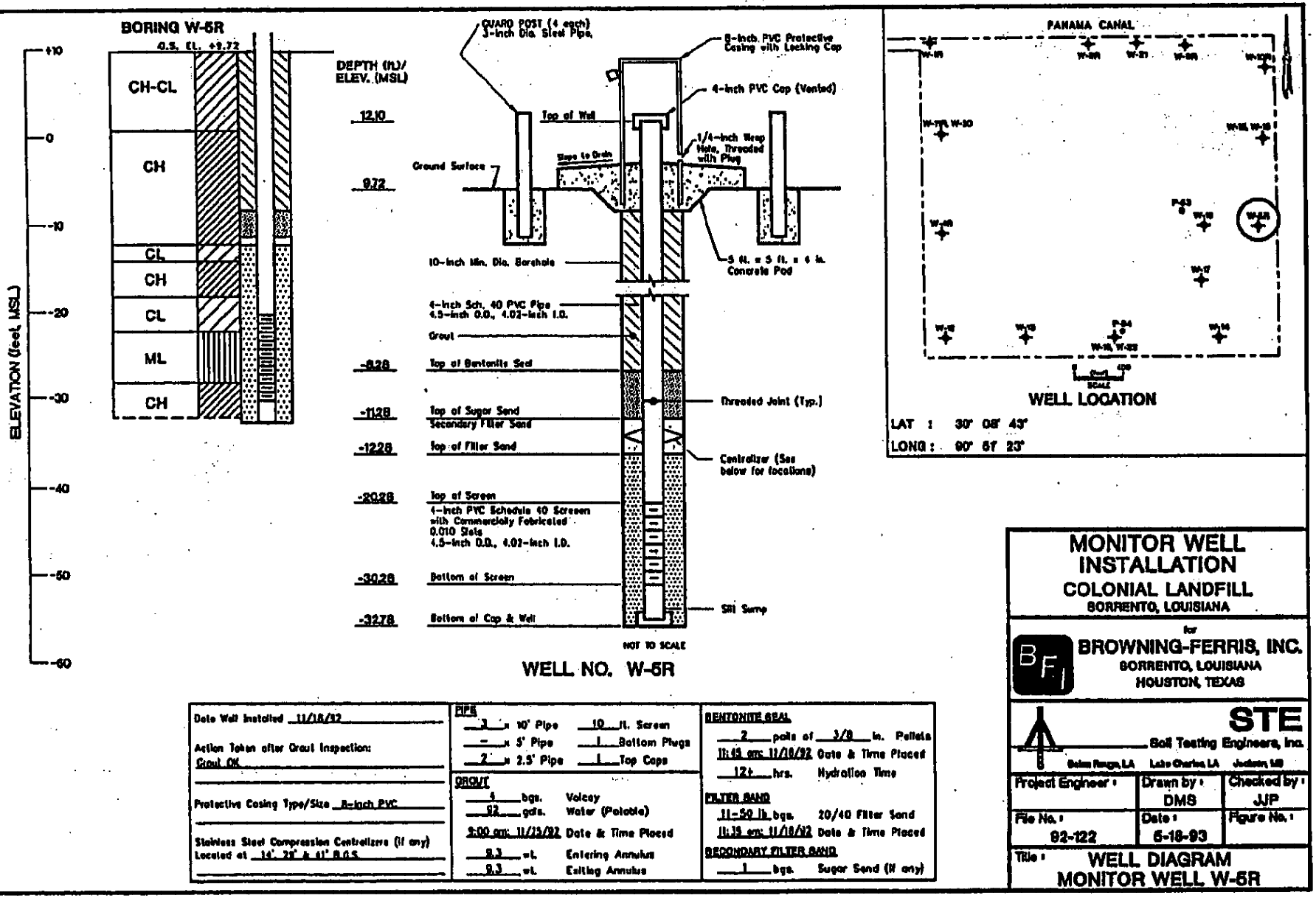
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-18-93	Figure No.:

Title: WELL DIAGRAM MONITOR WELL W-4R



Date Well Installed 11/18/92

Action Taken after Grout Inspection: Grout OK

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 14', 29' & 41' B.G.S.

PIPE

3 ea 10' Pipe — 10 ft. Screen

— ea 5' Pipe — 1 Bottom Plugs

2 ea 2.5' Pipe — 1 Top Caps

GROUT

4 bgs. Volcay

92 gals. Water (Potable)

9:00 am; 11/23/92 Date & Time Placed

8.3 wt. Entering Annulus

8.3 wt. Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in. Pellets

11:45 am; 11/18/92 Date & Time Placed

12± hrs. Hydration Time

FILTER SAND

11-50 lb bgs. 20/40 Filter Sand

11:39 am; 11/18/92 Date & Time Placed

SECONDARY FILTER SAND

1 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

for

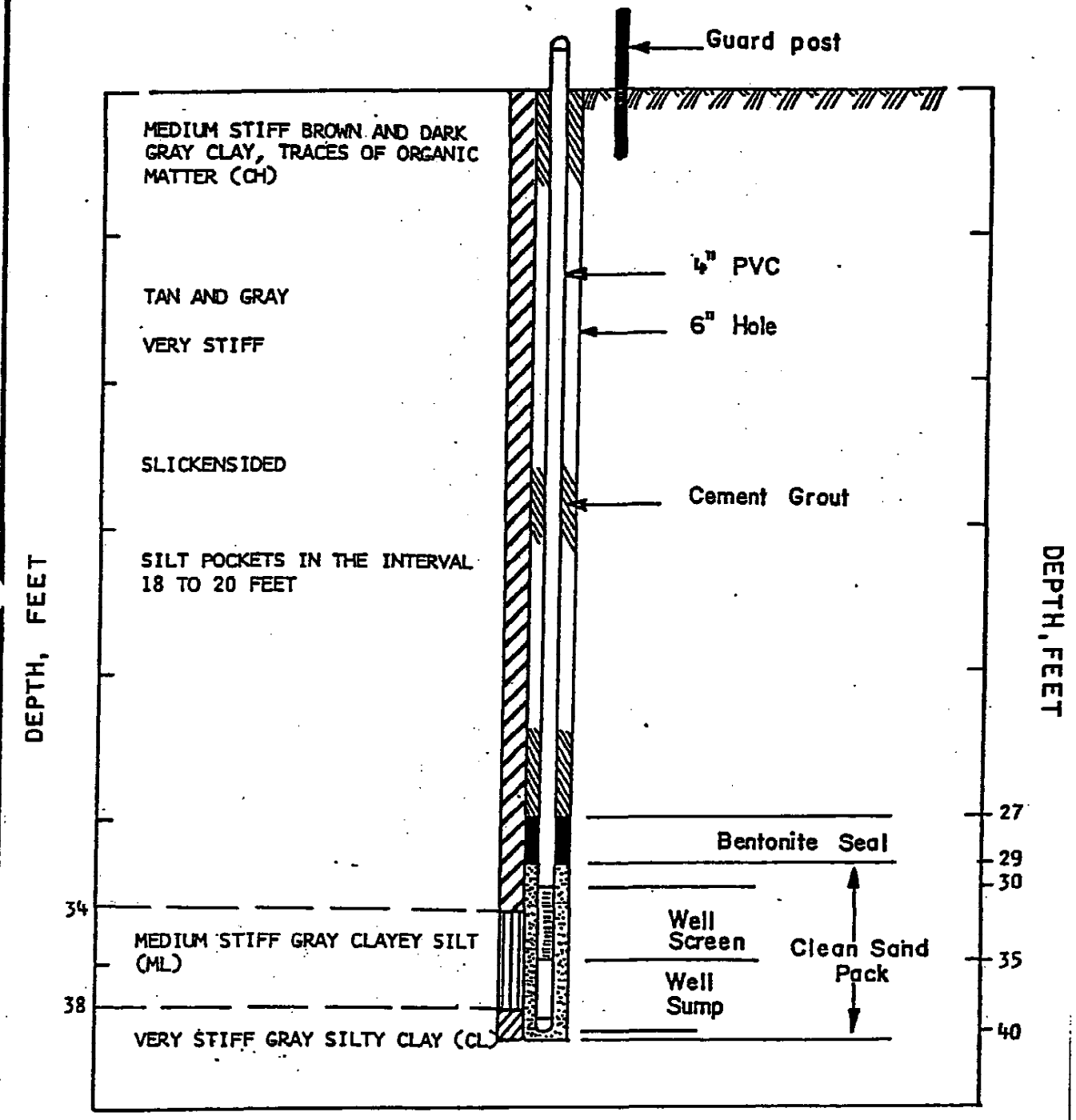
BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA · Lake Charles, LA · Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-18-93	Figure No.:

Title: **WELL DIAGRAM MONITOR WELL W-6R**

MONITORING WELL



Boring No. B-34
Well No. W-7

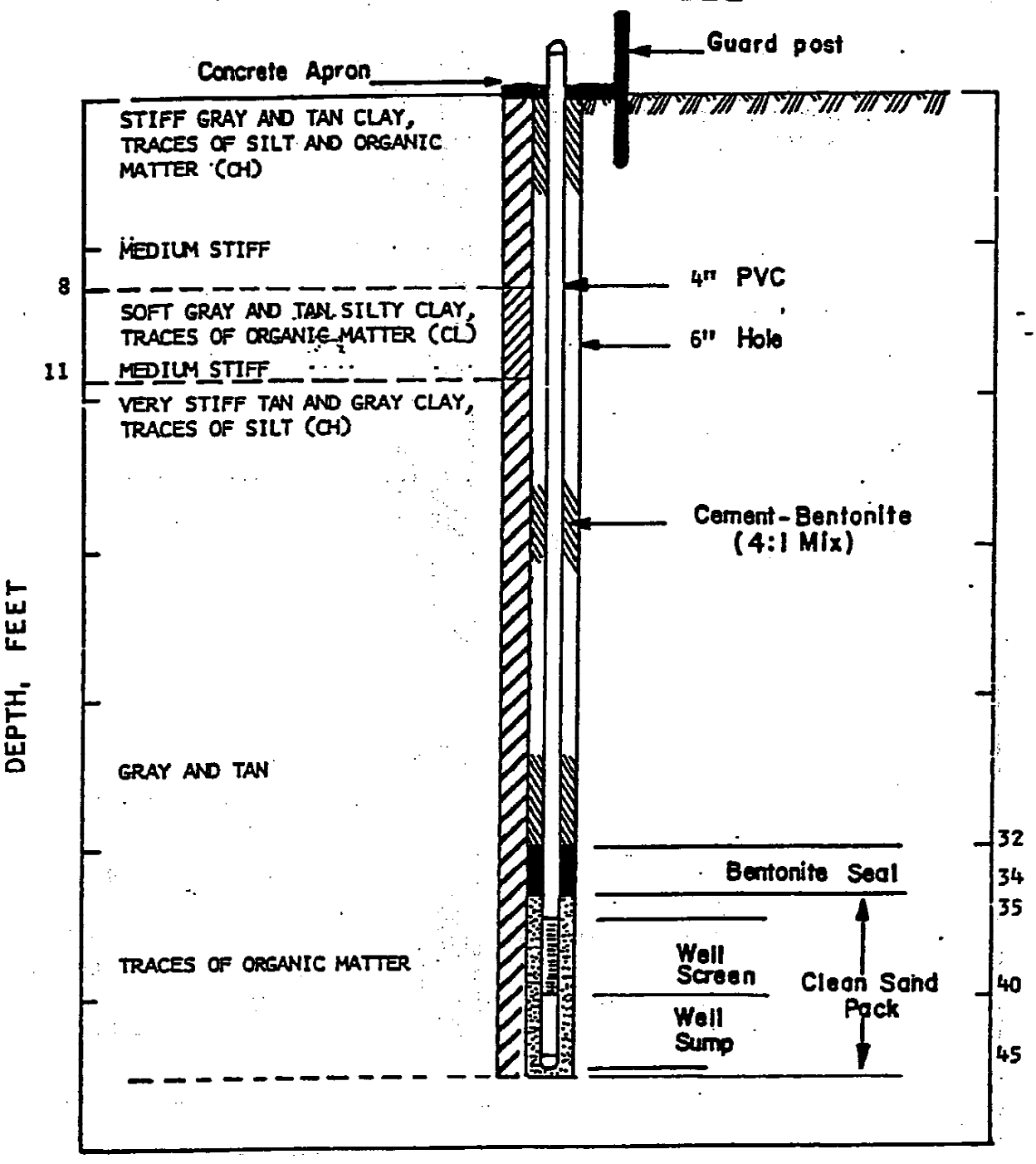
COLONIAL LANDFILL
SORRENTO, LOUISIANA

Drawn by			Proj No. 82-530
Engineer	[illegible]	11/29/82	

GID

Gulf Drilling Co., Inc.
Geotechnical Investigations

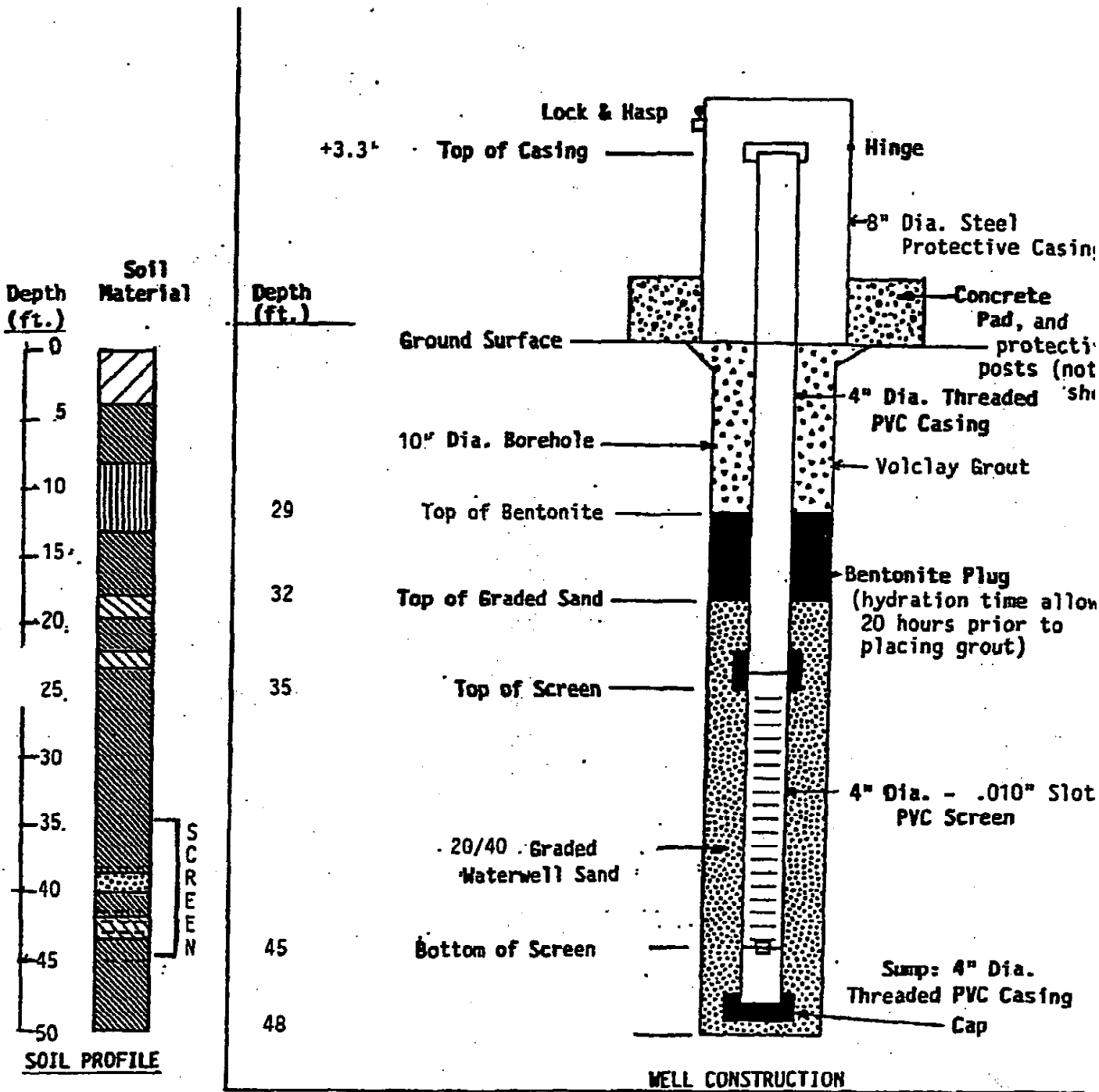
MONITORING WELL



Boring No. B-36
Well No. W-8

COLONIAL LANDFILL
SORRENTO, LOUISIANA

Drawn by	KAE	5/15/83	Proj No. 82-530	GID Gulf Drilling Co., Inc.

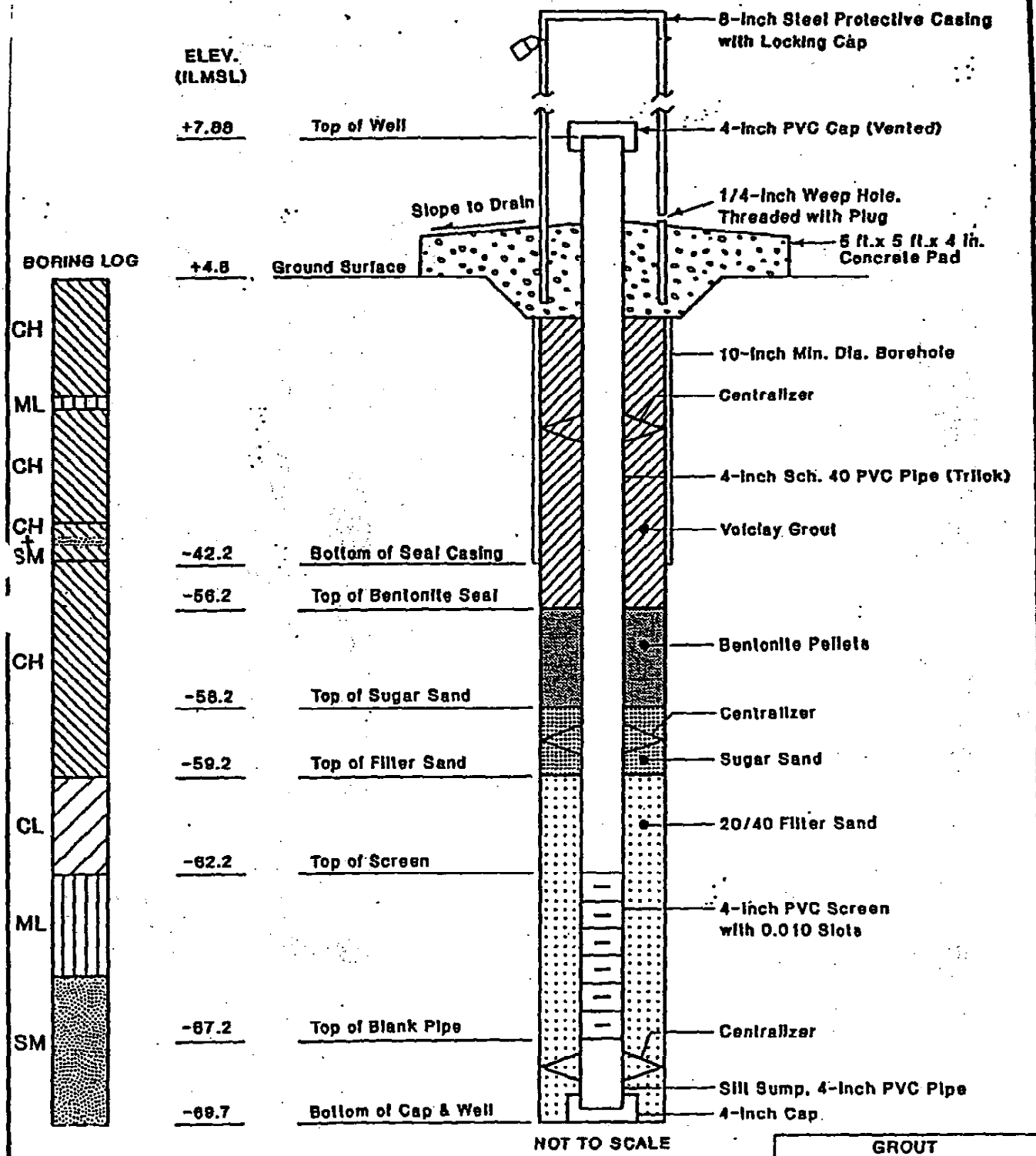


Firm SILTY CLAY FILL (CL)
Stiff to very stiff CLAY (CH)
Soft very SILTY CLAY (CL-ML)
Stiff SILTY CLAY (CL)
Firm SANDY SILT (SC)
2" to 4" sandy silt or silty sand lenses

MONITOR WELL NO. 8A

STEI File: 89-1050

Grout Mix:
Water: 46 gallons
Volclay: 100 pounds
Initiator: 4 pounds
Measured Weight: 9.4 lbs./gal.



MONITOR WELL MW-8B

Date Installed: 10-13-89

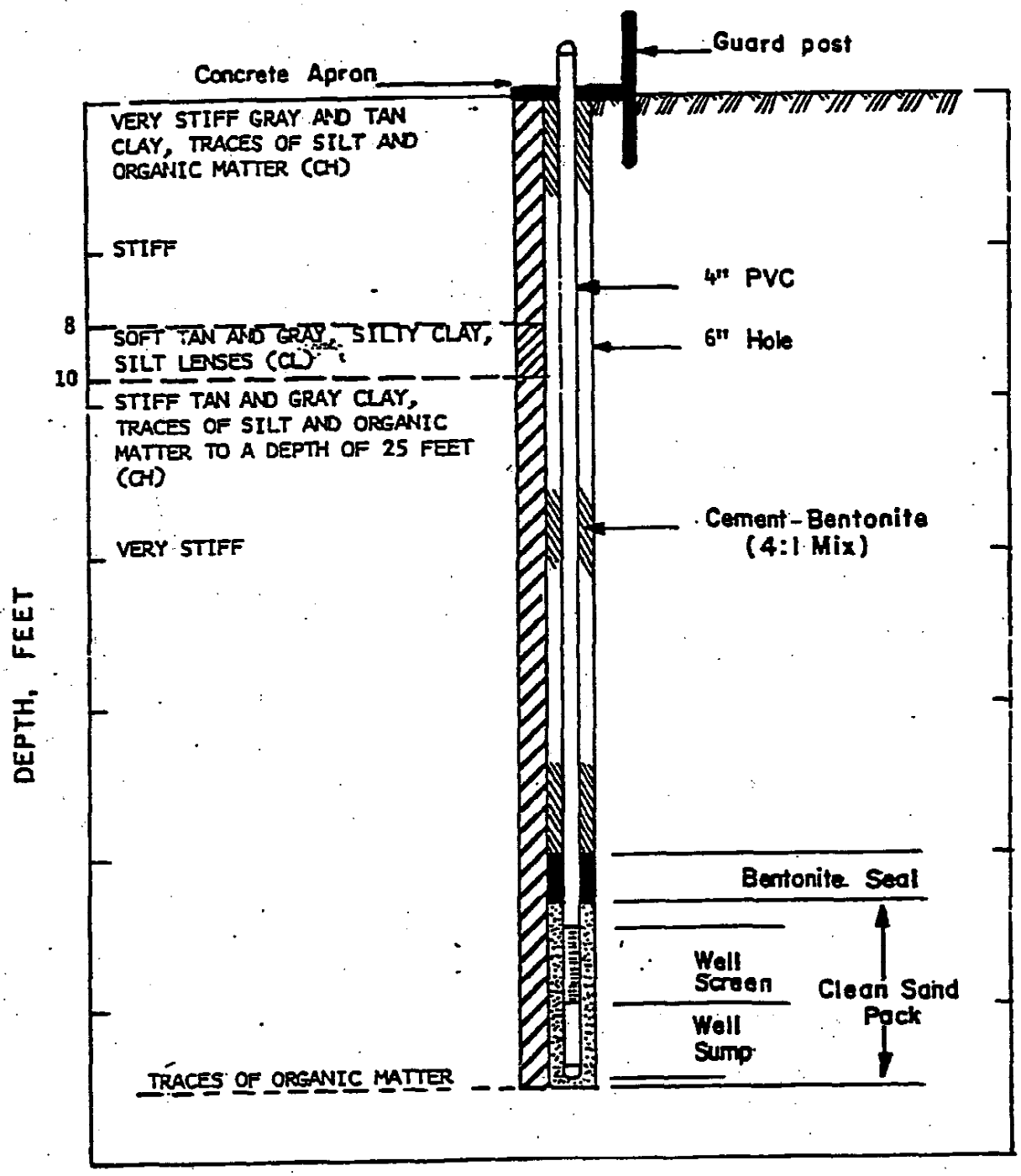
GROUT		
Water	176	gals.
Volclay	8	sacks
Weight: In	9.4-9.7	lbs/gal
Out	8.5	lbs/gal

COLONIAL LANDFILL

SOIL TESTING ENGINEERS, INC.

FILE NO.: 89-108

MONITORING WELL

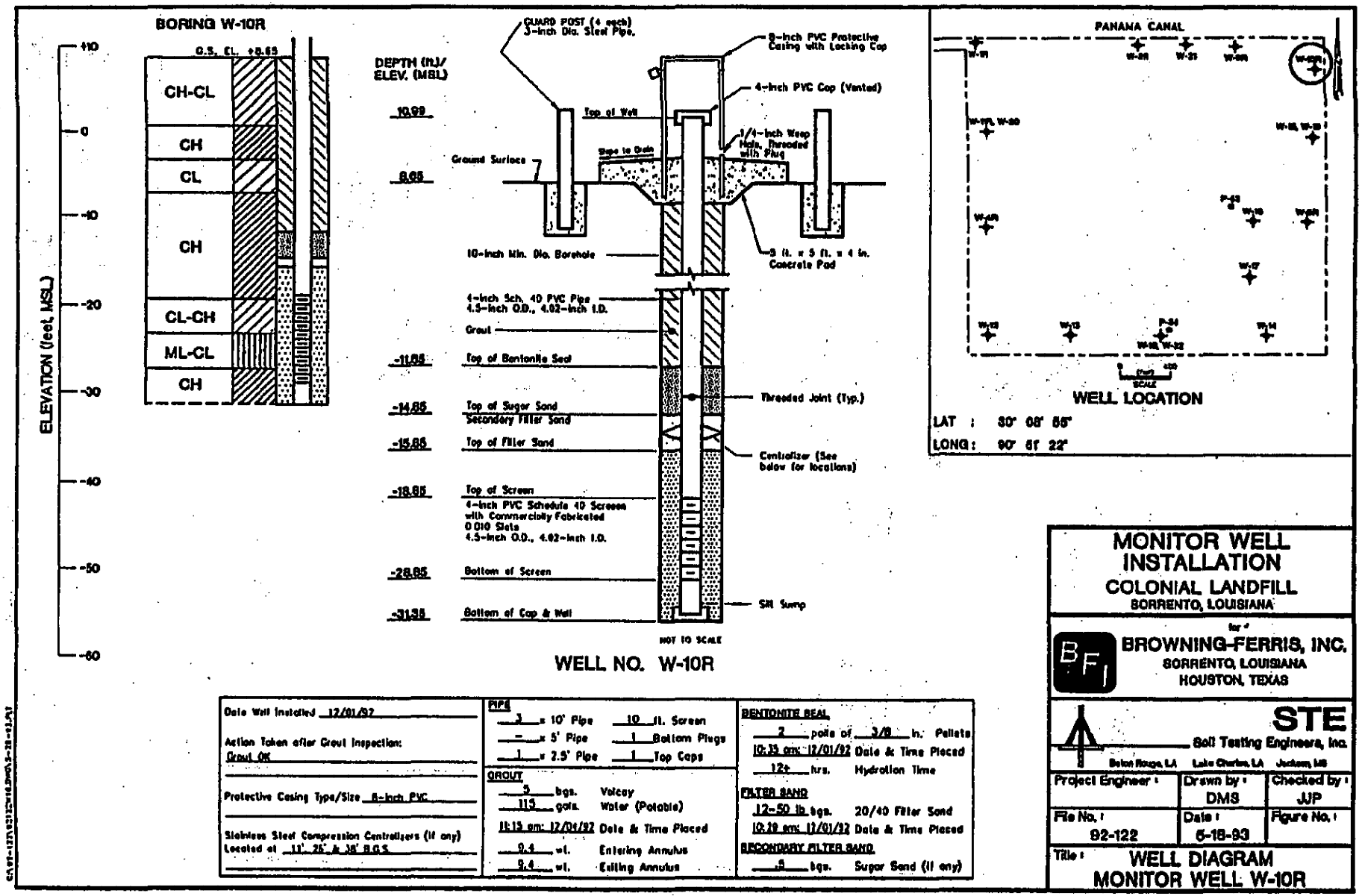


Boring No. B-39
Well No. W-9

COLONIAL LANDFILL
SORRENTO, LOUISIANA

Drawn by	KAE	5/15/93	Proj No. 82-530
		5/16/93	

GID 6 Gulf Drilling Co., Inc.
Geotechnical Investigations



Date Well Installed 12/01/92

Action Taken after Grout Inspection: Grout OK

Protective Casing Type/Size 8-Inch PVC

Slotview Steel Compression Centralizers (if any) Located at 11', 25' & 38' B.G.S.

PIPE

3 x 10' Pipe — 10 ft. Screen

– x 5' Pipe — 1 Bottom Plugs

1 x 2.5' Pipe — 1 Top Caps

GROUT

5 bgs. Volcay

115 gals. Water (Potable)

11:15 am; 12/01/92 Date & Time Placed

9.4 wt. Entering Annulus

9.4 wt. Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in. Pellets

10:35 am; 12/01/92 Date & Time Placed

12+ hrs. Hydration Time

FILTER SAND

12-50 lb bgs. 20/40 Filter Sand

10:20 am; 12/01/92 Date & Time Placed

SECONDARY FILTER SAND

5 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

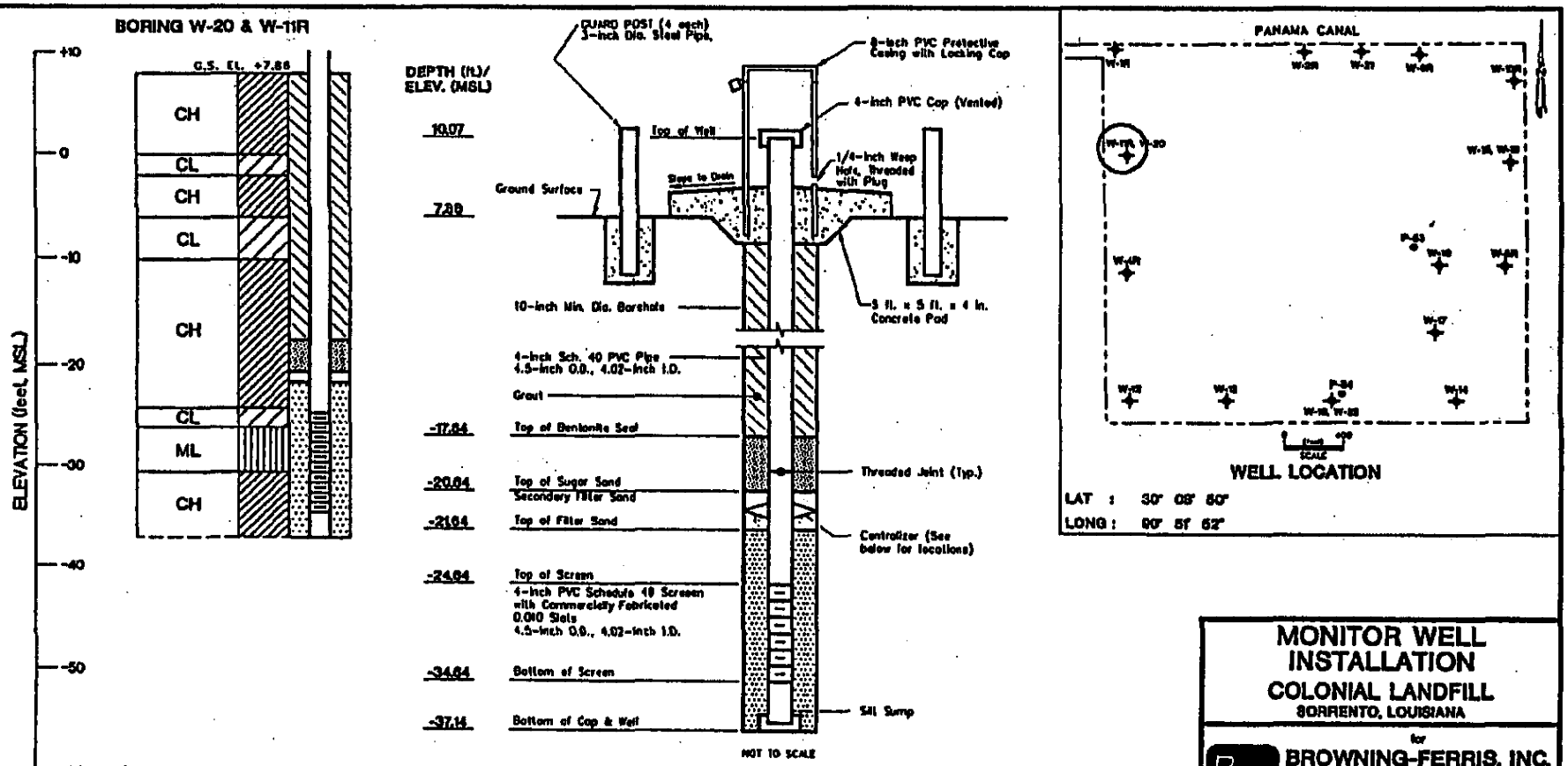
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE
Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-18-93	Figure No.:

Title: WELL DIAGRAM MONITOR WELL W-10R



Date Well Installed 12/07/92

Action Taken after Grout Inspection:
Topped off Grout 12/18/92

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any)
Located at 13', 30' & 43' B.G.S.

PIPE

3	x 10' Pipe	10	ft. Screen
1	x 5' Pipe	1	Bottom Plugs
1	x 2.5' Pipe	1	Top Caps

GROUT

6 bgs. Volcay
138 gals. Water (Potable)
10:55 am; 12/08/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in. Pellets
4:30 pm; 12/07/92 Date & Time Placed
12+ hrs. Hydration Time

FILTER SAND

10-50 ft. bgs. 20/40 Filter Sand
4:15 pm; 12/07/92 Date & Time Placed

SECONDARY FILTER SAND

9 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

for

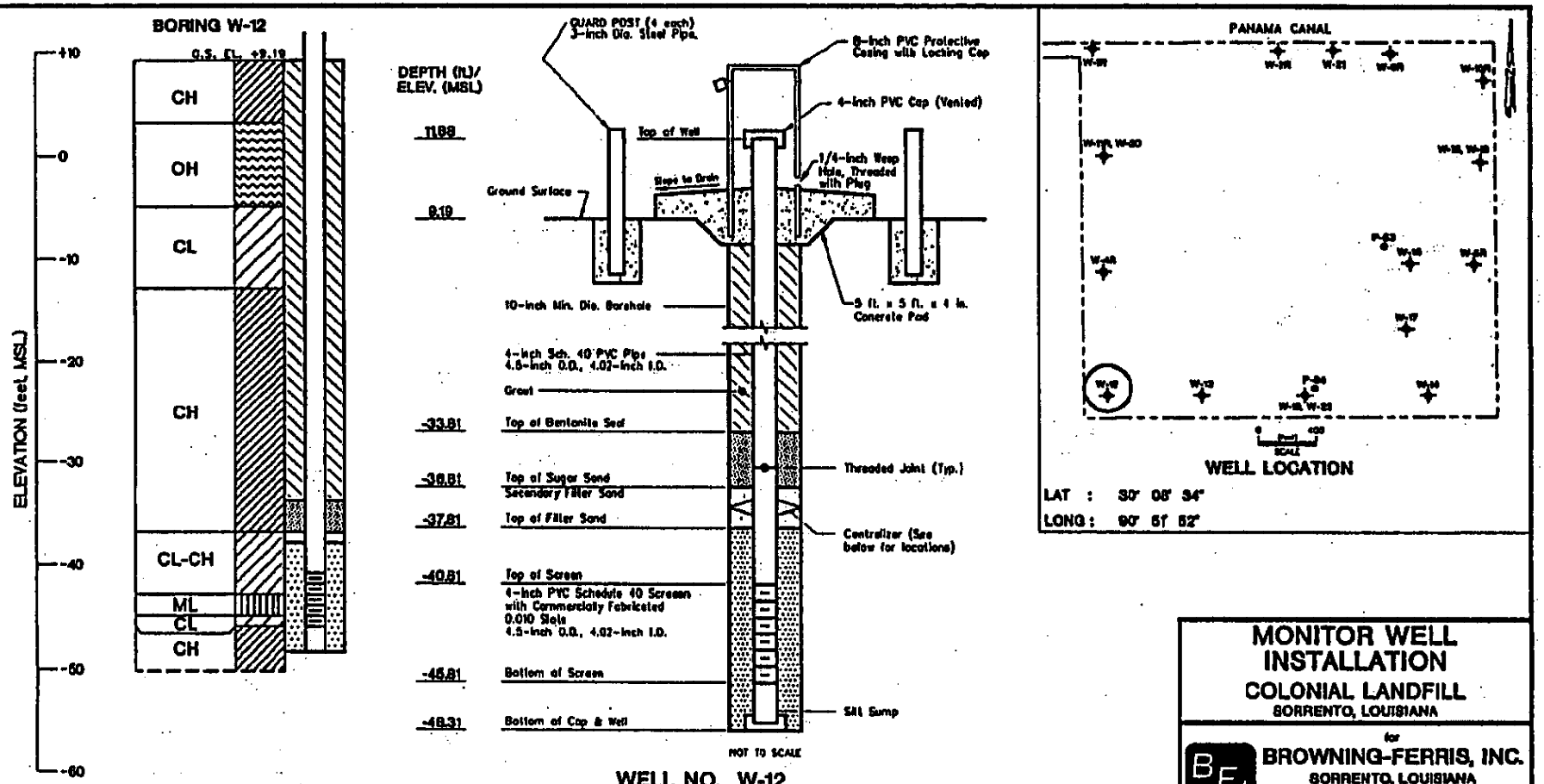
BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-18-93	Figure No.:

Title: WELL DIAGRAM
MONITOR WELL W-11R

CAD:\LFR\92122\W11.DWG\5-26-93.PLT



Date Well Installed 11/03/92

Action Taken after Grout Inspection: Grout OK

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 19', 34', 49' & 58' B.G.S.

PIPE

5 x 10' Pipe — 5 ft. Screen
— x 5' Pipe — 1 Bottom Plugs
2 x 2.5' Pipe — 1 Top Caps

GROUT

6 bgs. Volcay
138 gals. Water (Potable)
11:11:15 am; 11/03/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL

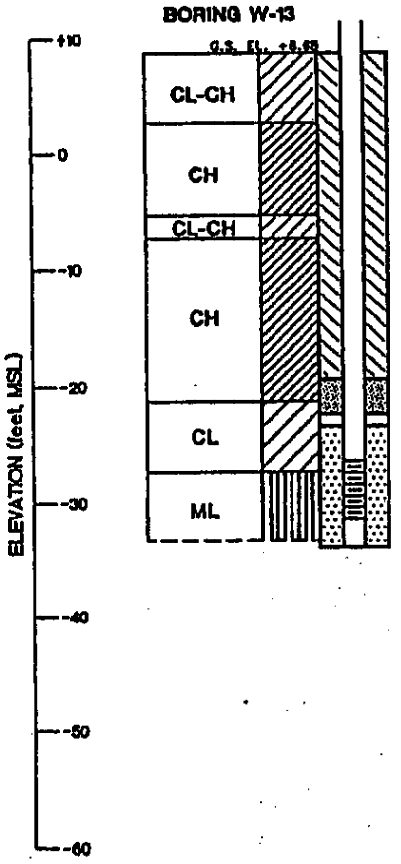
2 pails of 3/8 in. Pellets
11:45 am; 11/03/92 Date & Time Placed
12+ hrs. Hydration Time

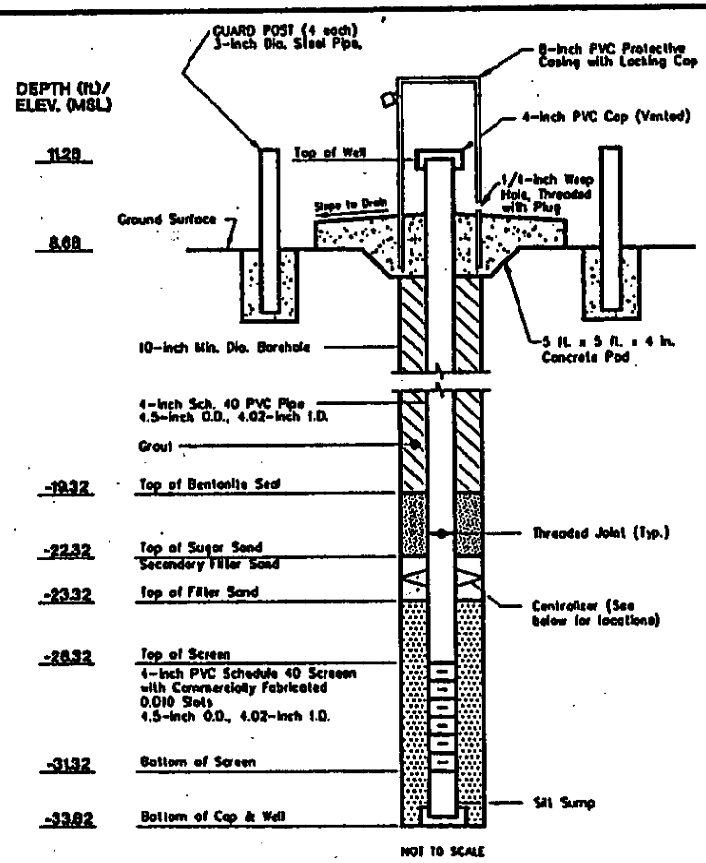
FILTER SAND

8-50 lb bgs. 20/40 Filter Sand
11:35 am; 11/03/92 Date & Time Placed

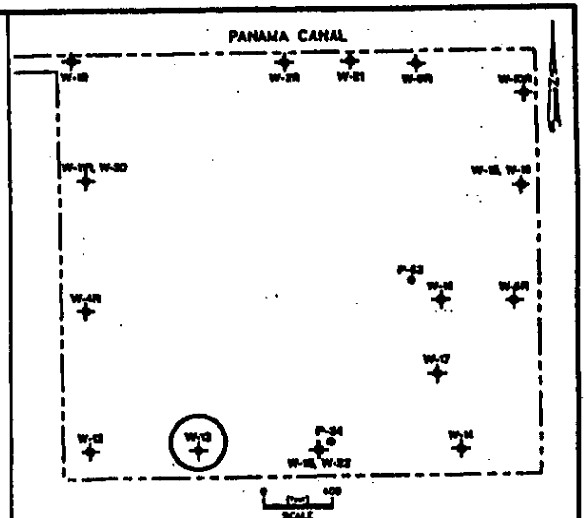
SECONDARY FILTER SAND

5 bgs. Sugar Sand (if any)





WELL NO. W-13



WELL LOCATION

LAT : 30° 08' 34"
LONG : 90° 51' 54"

Date Well Installed 11/05/92

Action Taken after Grout Inspection:
None

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any)
Located at 4', 19', 36' & 41' B.G.S.

PIPE
3 x 10' Pipe — 5 ft. Screen
1 x 5' Pipe — 1 Bottom Plugs
2 x 2.5' Pipe — 1 Top Caps

GROUT
6 bgs. Volcay
138 gals. Water (Potable)
16:00 pm; 11/06/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL
2 pails of 3/8 in. Pellets
4:45 pm; 11/05/92 Date & Time Placed
12± hrs. Hydration Time

FILTER SAND
7-50 lb bgs. 20/40 Filter Sand
4:35 pm; 11/05/92 Date & Time Placed

SECONDARY FILTER SAND
5 bgs. Sugar Sand (if any)

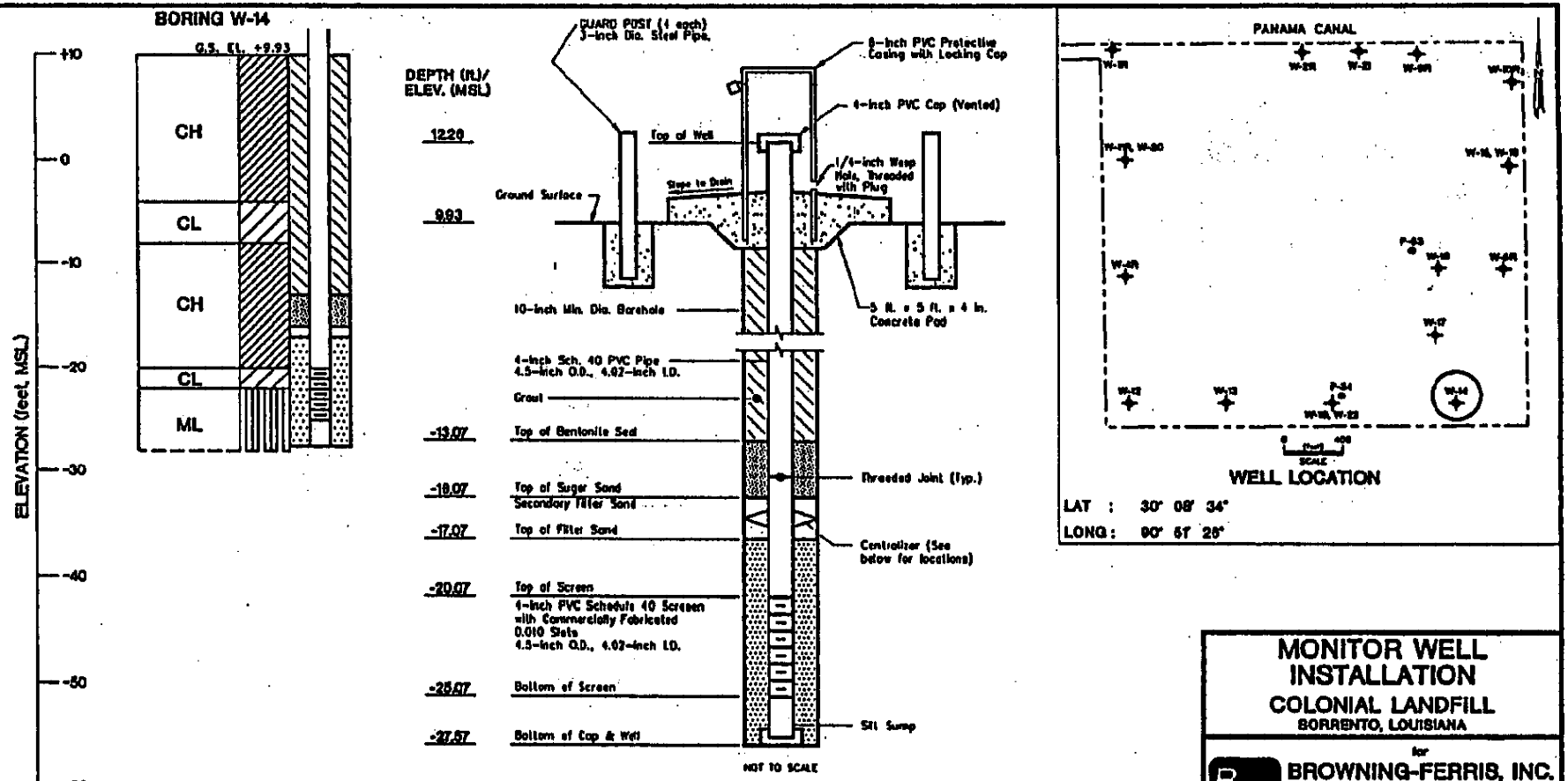
MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

for
BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-26-93	Figure No.:

Title: WELL DIAGRAM
MONITOR WELL W-13



Date Well Installed 11/17/92

Action Taken after Grout Inspection: None

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 14', 28' & 38' B.G.S.

PIPE

3	= 10' Pipe	5	ft. Screen
–	= 5' Pipe	1	Bottom Plugs
2	= 2.5' Pipe	1	Top Caps

GROUT

4	bgs.	Volclay
92	gals.	Water (Potable)
18:00 pm: 11/24/92		Date & Time Placed
9.4	wt.	Entering Annulus
9.4	wt.	Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in. Pellets
12:30 pm: 11/17/92 Date & Time Placed
12+ hrs. Hydration Time

FILTER SAND

9-50 ft. bgs. 20/40 Filter Sand
12:20 pm: 11/17/92 Date & Time Placed

SECONDARY FILTER SAND

1 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

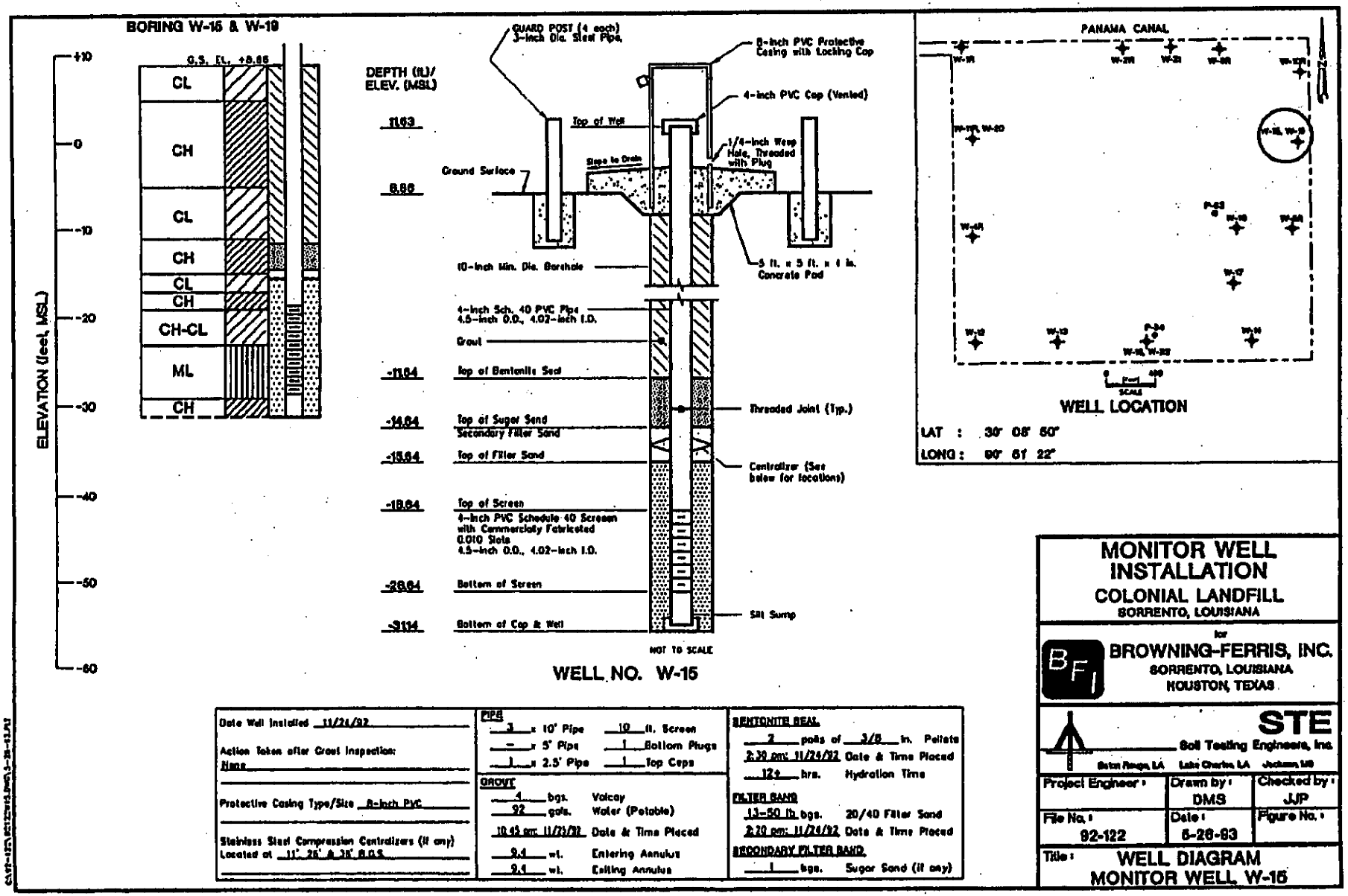
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 5-26-93	Figure No.:

Title: **WELL DIAGRAM MONITOR WELL W-14**



Date Well Installed 11/24/92

Action Taken after Grout Inspection: None

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 11', 26' & 38' B.G.S.

PIPE

3	x 10' Pipe	10	ft. Screen
—	x 5' Pipe	1	Bottom Plugs
1	x 2.5' Pipe	1	Top Caps

GROUT

4	bgs.	Volcay
92	gals.	Water (Potable)
10:45 am; 11/23/92		Date & Time Placed
9.4	wt.	Entering Annulus
9.4	wt.	Exiting Annulus

BENTONITE SEAL

2	pails of 3/8	in. Pellets
2:30 pm; 11/24/92		Date & Time Placed
12+	hrs.	Hydration Time

FILTER SAND

13-50 lb	bgs.	20/40 Filter Sand
2:20 pm; 11/24/92		Date & Time Placed

SECONDARY FILTER SAND

1	bgs.	Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

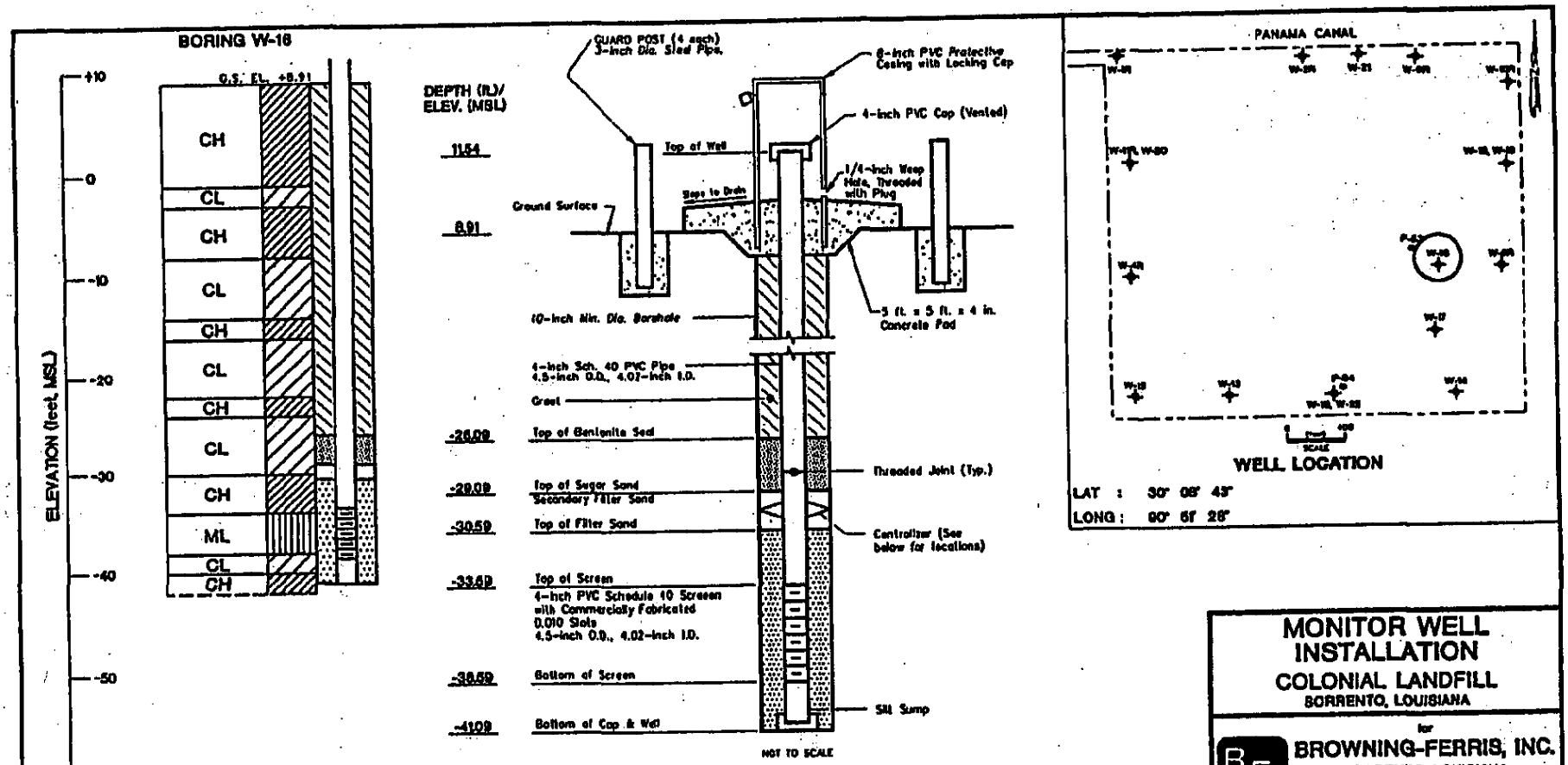
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE
Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-26-93	Figure No.:

Title: WELL DIAGRAM MONITOR WELL W-15



Date Well Installed 12/15/92

Action Taken after Grout Inspection:
None

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any)
Located at 10', 25', 40' & 48' B.G.S.

PIPE

4	x 10' Pipe	5	ft. Screen
1	x 5' Pipe	1	Bottom Plugs
1	x 2.5' Pipe	1	Top Caps

GROUT

6 bgs. Volcay
136 gals. Water (Potable)
10:15 am; 12/18/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in. Pellets
10:30 am; 12/15/92 Date & Time Placed
12+ hrs. Hydration Time

FILTER SAND

10-30 lb bgs. 20/40 Filter Sand
10:20 am; 12/15/92 Date & Time Placed

SECONDARY FILTER SAND

1 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

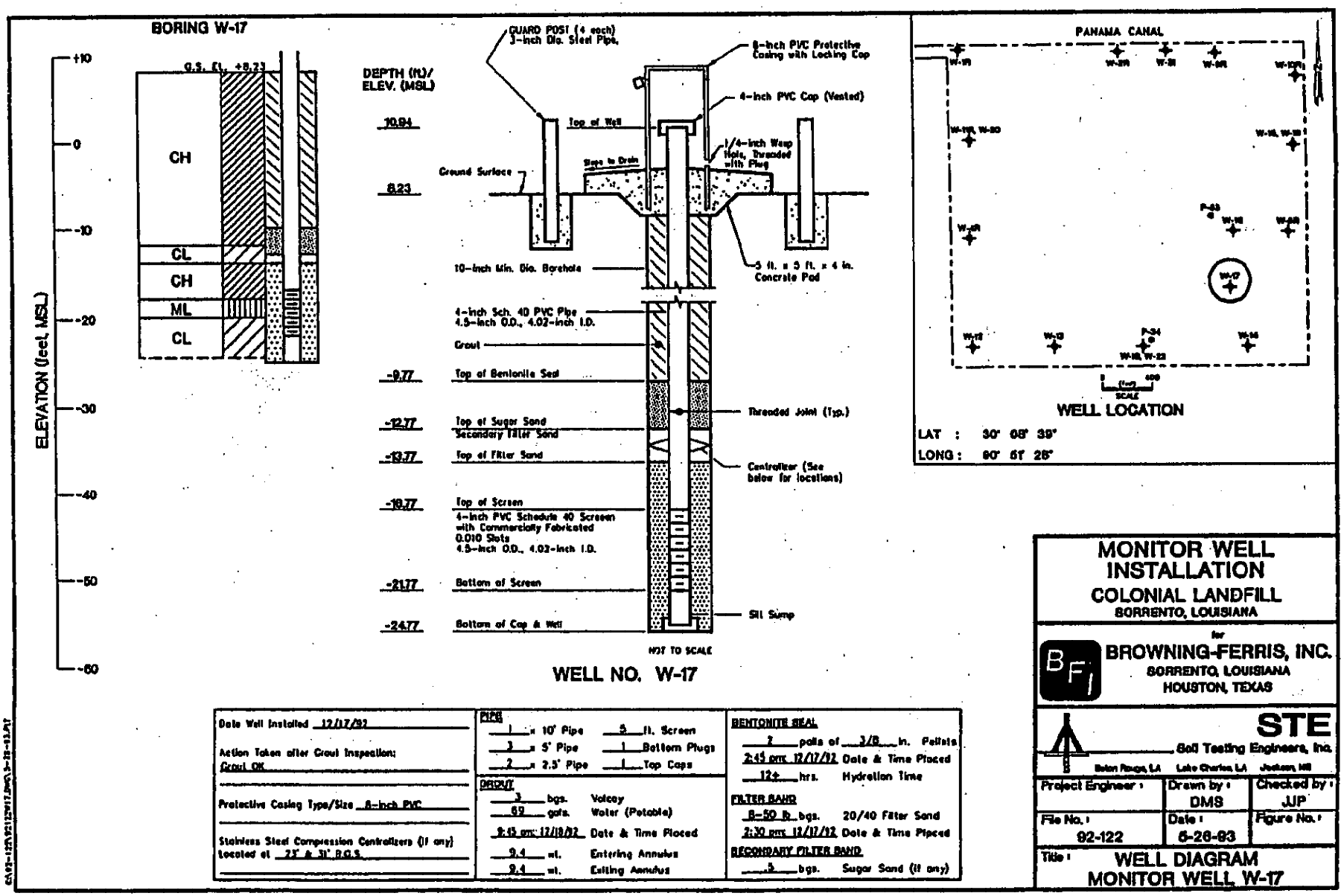
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE
Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 5-26-93	Figure No.:

Title: WELL DIAGRAM
MONITOR WELL W-16



Date Well Installed 12/17/92

Action Taken after Grout Inspection:
Grout OK

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any)
located at 23' & 31' B.G.S.

PIPE

1	x 10' Pipe	5	ft. Screen
3	x 5' Pipe	1	Bottom Plugs
2	x 2.5' Pipe	1	Top Caps

GROUT

3 bgs.	Volcay
69 gals.	Water (Potable)
9:45 am; 12/18/92	Date & Time Placed
9.4 wt.	Entering Annulus
9.4 wt.	Exiting Annulus

BENTONITE SEAL

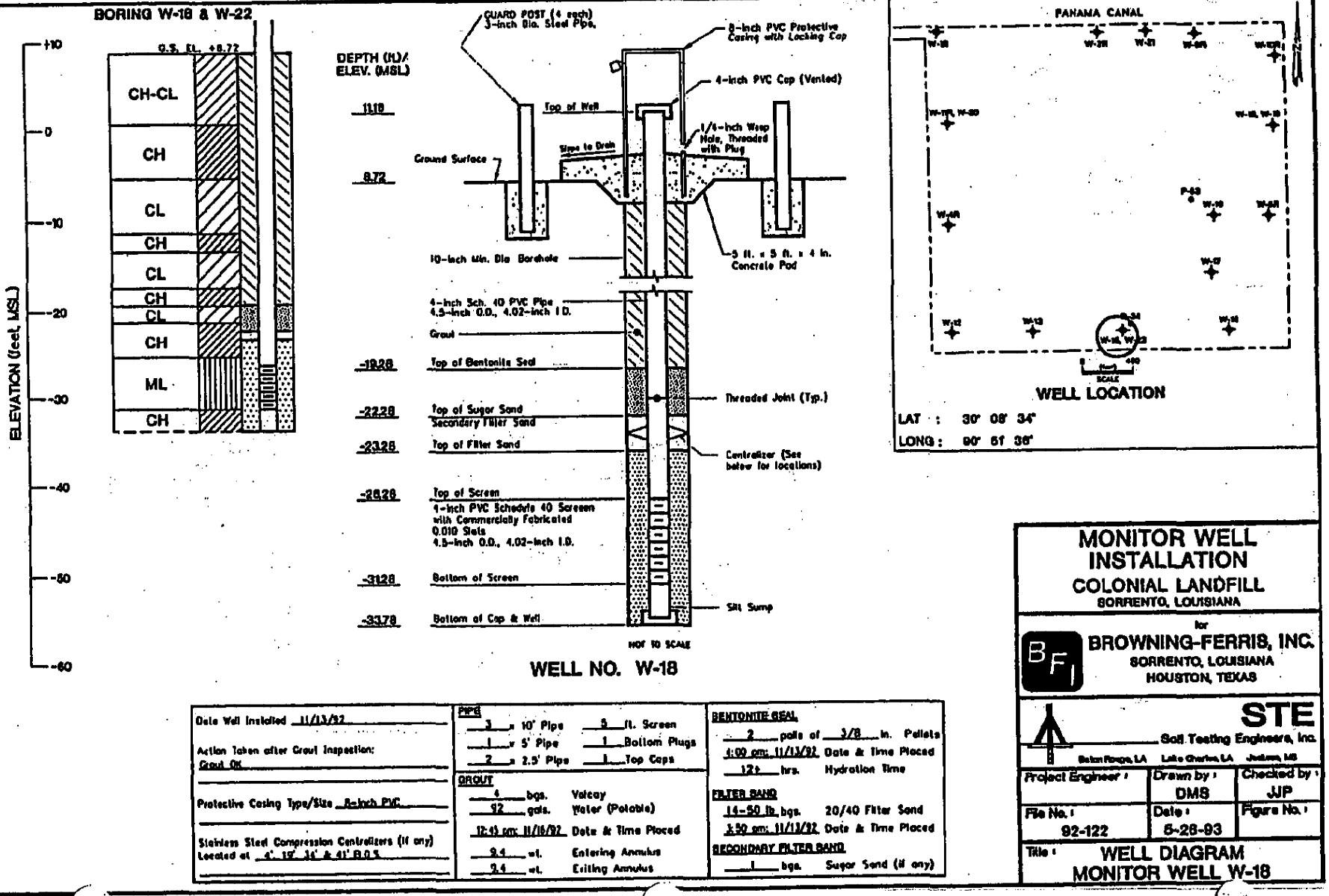
2	pails of 3/8 in. Pellets
2:45 pm; 12/17/92	Date & Time Placed
12+ hrs.	Hydration Time

FILTER SAND

8-50 lb bgs.	20/40 Filter Sand
2:30 pm; 12/17/92	Date & Time Placed

SECONDARY FILTER SAND

5 bgs.	Sugar Sand (if any)



Date Well Installed 11/13/92

Action Taken after Grout Inspection: Grout OK

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 4', 19', 34' & 41' B.G.S.

PIPE
3 = 10' Pipe
1 = 5' Pipe
2 = 2.5' Pipe
5 ft. Screen
1 Bottom Plugs
1 Top Caps

GROUT
4 bgs. Volcay
92 gals. Water (Potable)
12:45 pm; 11/18/92 Date & Time Placed
9.4 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL
2 pails of 3/8 in. Pellets
4:00 pm; 11/13/92 Date & Time Placed
12+ hrs. Hydration Time

FILTER SAND
14-50 lb bgs. 20/40 Filter Sand
3:30 pm; 11/13/92 Date & Time Placed

SECONDARY FILTER SAND
1 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

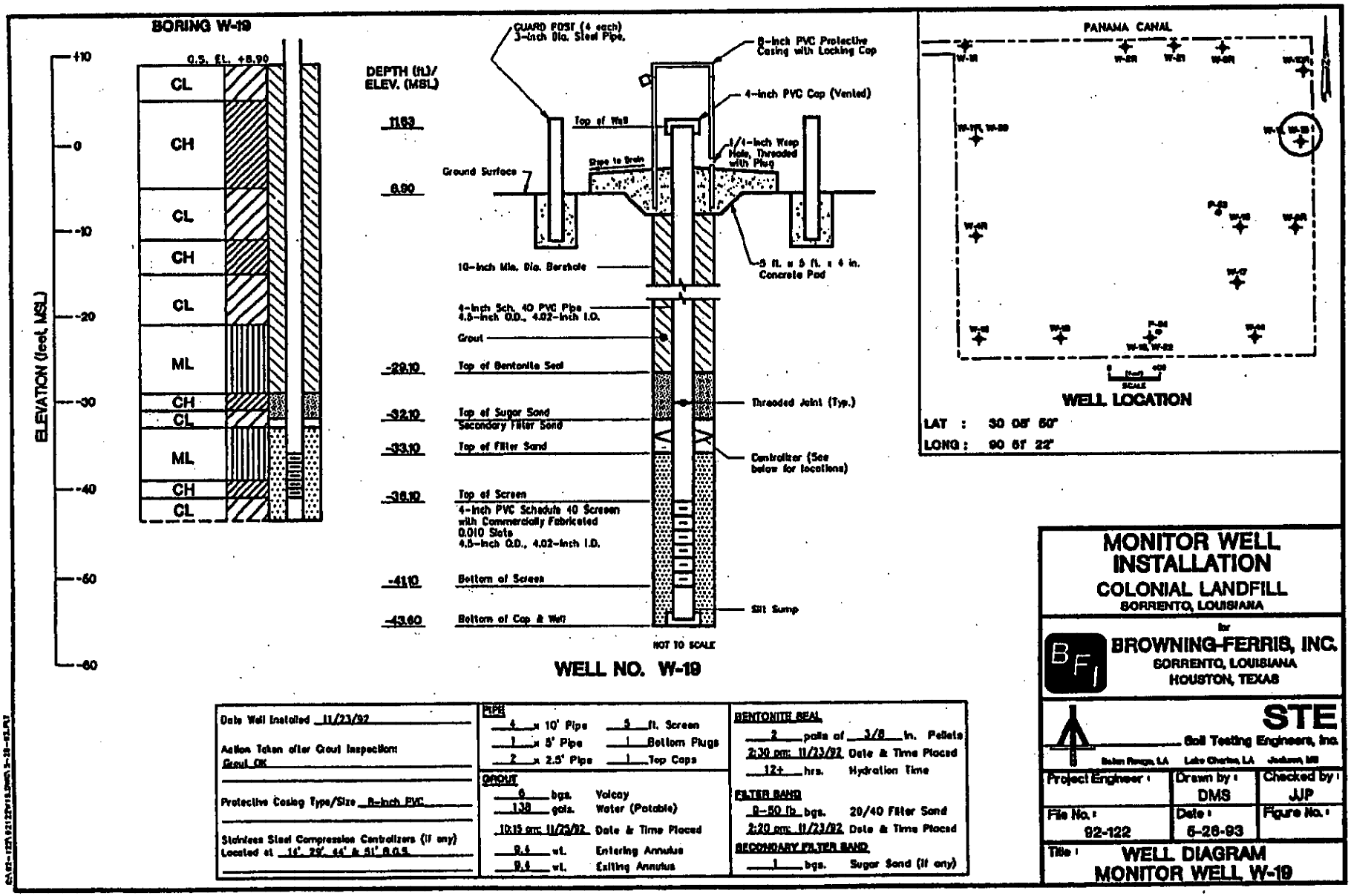
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE
Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 5-28-93	Figure No.:

Title: WELL DIAGRAM MONITOR WELL W-18



Date Well Installed 11/23/92

Action Taken after Grout Inspection: Grout OK

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 14', 29', 44' & 51' B.G.S.

PIPE

4	x 10' Pipe	5	ft. Screen
1	x 5' Pipe	1	Bottom Plugs
2	x 2.5' Pipe	1	Top Caps

GROUT

6	bgs.	Volcay
138	gals.	Water (Potable)
10:15 am; 11/23/92		Date & Time Placed
9.4	wt.	Entering Annulus
9.4	wt.	Exiting Annulus

BENTONITE SEAL

2	pails of 3/8	in. Pellets
2:30 pm; 11/23/92		Date & Time Placed
12+	hrs.	Hydration Time

FILTER SAND

8-50 lb	bgs. 20/40 Filter Sand
2:20 pm; 11/23/92	Date & Time Placed

SECONDARY FILTER SAND

1	bgs.	Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

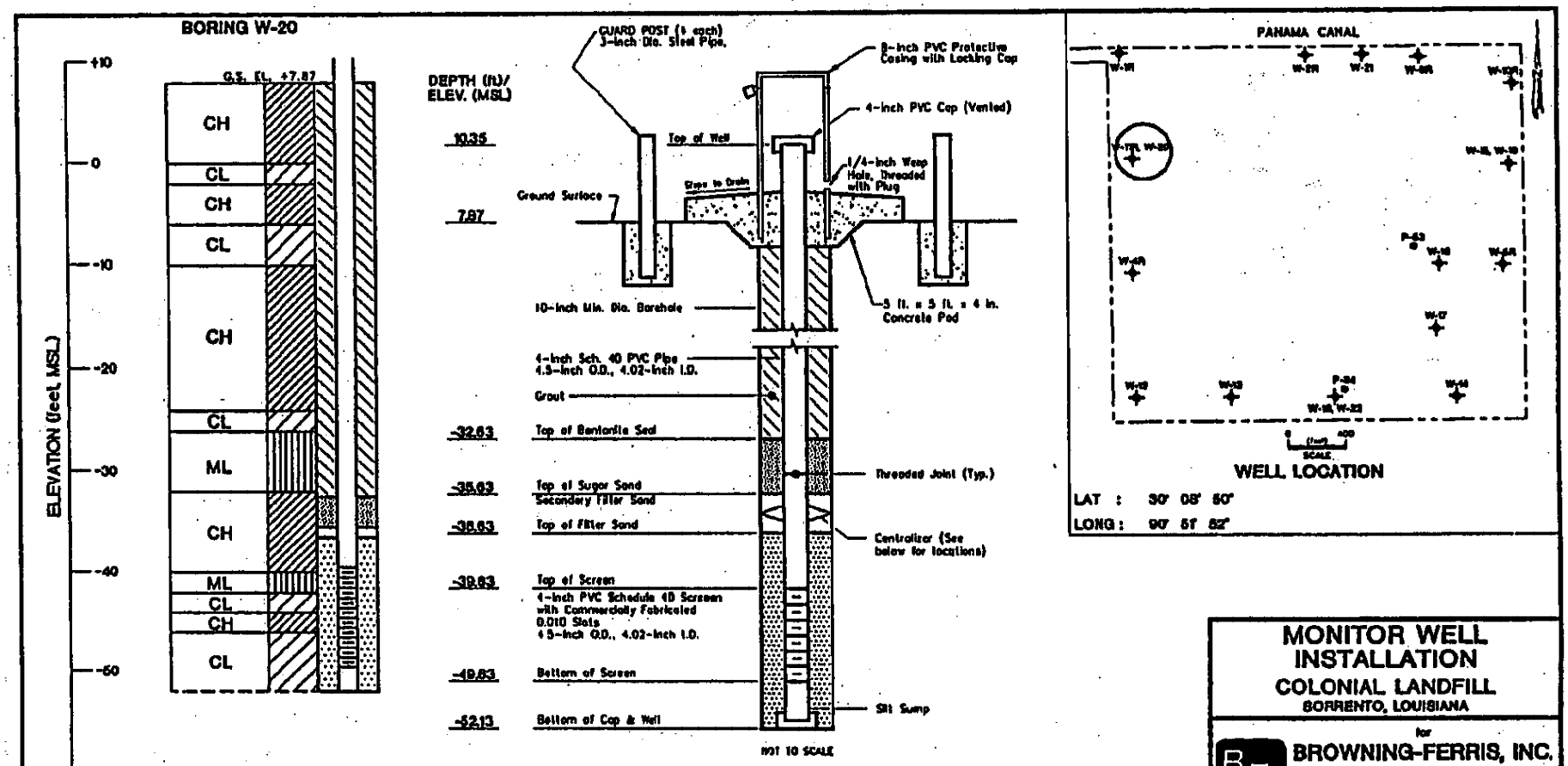
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA · Lake Charles, LA · Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-26-93	Figure No.:

Title: **WELL DIAGRAM MONITOR WELL W-19**



Date Well Installed 12/01/92

Action Taken after Grout Inspection: Additional Grout added 12/08/92 to ground surface

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any) Located at 15', 30', 45' & 58' B.G.S.

PIPE

4	x 10' Pipe	10	ft. Screen
-	x 5' Pipe	1	Bottom Plugs
1	x 2.5' Pipe	1	Top Caps

GROUT

11 bgs.	Volcay
233 gals.	Water (Potable)
10:15 am; 12/04/92	Date & Time Placed
9.4 wt.	Entering Annulus
9.4 wt.	Exiting Annulus

BENTONITE SEAL

2 pails of 3/8 in.	Pellets
4:30 pm; 12/03/92	Date & Time Placed
12± hrs.	Hydration Time

FILTER SAND

13-50 lb bgs.	20/40 Filter Sand
4:15 pm; 12/03/92	Date & Time Placed

SECONDARY FILTER SAND

5 bgs.	Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

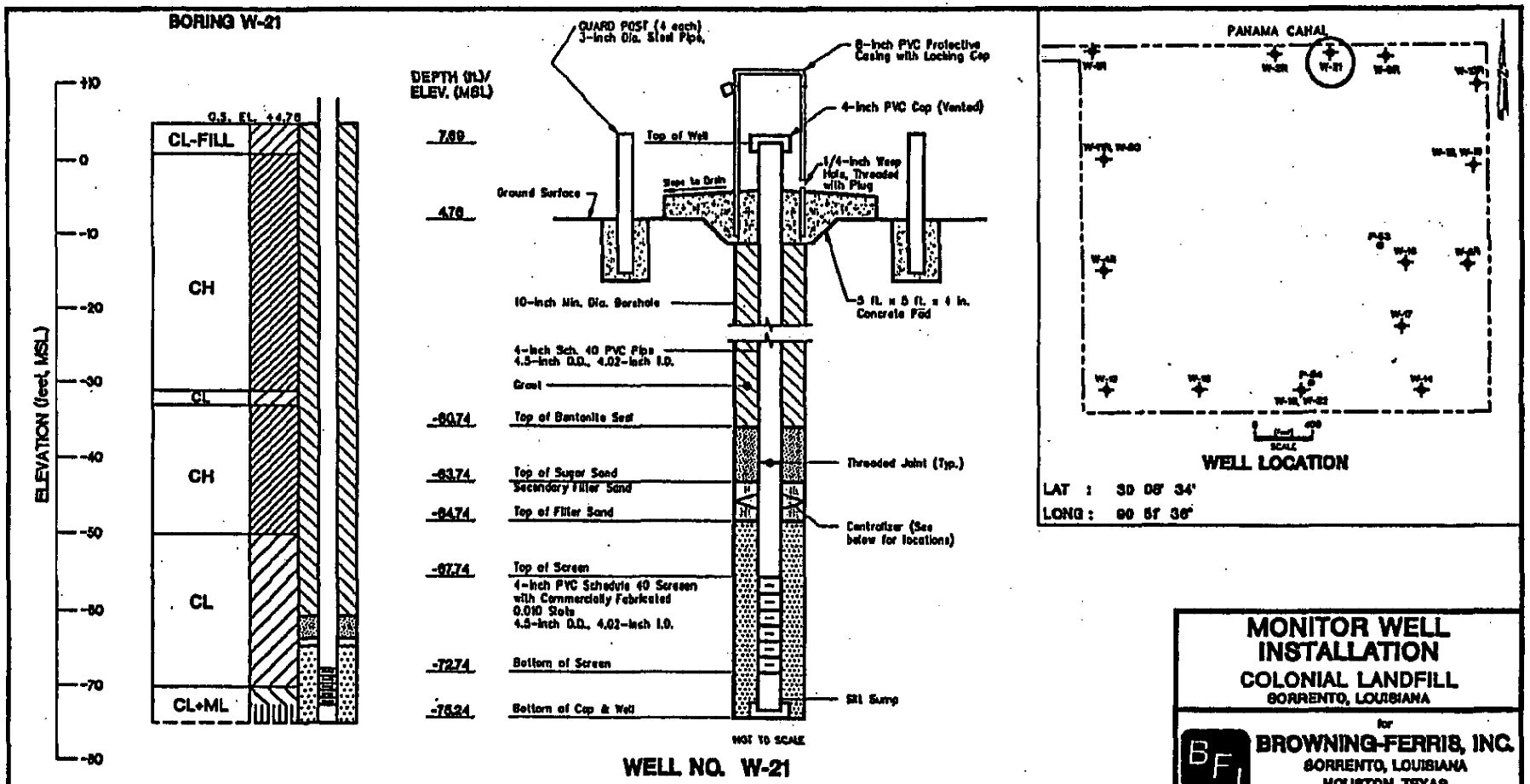
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA · Lake Charles, LA · Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 6-28-93	Figure No.:

Title: WELL DIAGRAM MONITOR WELL W-20



Date Well Installed 8/25/93

Action Taken after Grout Inspection:
Additional 18 inches of grout added w/surface completed.

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Centralizers (if any)
Located at 76', 71', 66', 41', & 26' B.G.S.

PIPE

6	x 10' Pipe	5	ft. Screen
3	x 5' Pipe	1	Bottom Plugs
1	x 2.5' Pipe	1	Top Caps

GROUT

6 bgs.	Volcay
1.35 gals.	Water (Potable)
11:30 am: 8/25/93	Date & Time Placed
8.4,8.5,8.4 wt.	Entering Annulus
8.5 wt.	Exiting Annulus

BENTONITE SEAL

1	pails of 1/2 in. Pellets
7:45 pm: 8/25/93	Date & Time Placed
18 hrs.	Hydration Time

FILTER SAND

6.5-50 lb bgs.	20/40 Filter Sand
1:25 pm: 11/10/93	Date & Time Placed

SECONDARY FILTER SAND

1 bgs.	Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

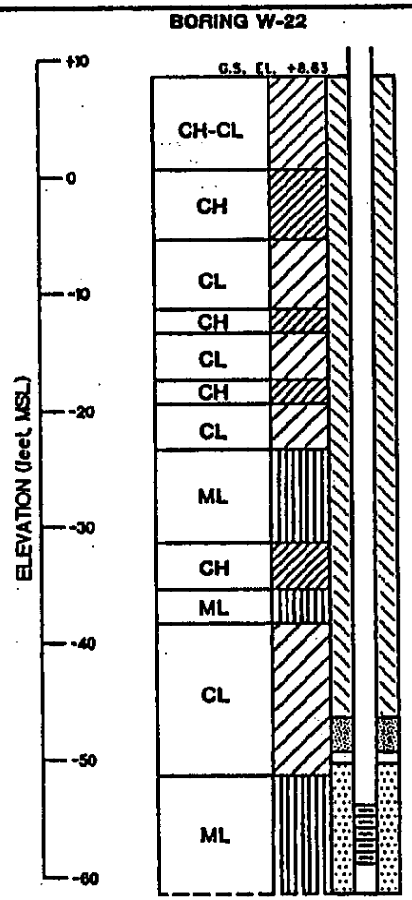
for

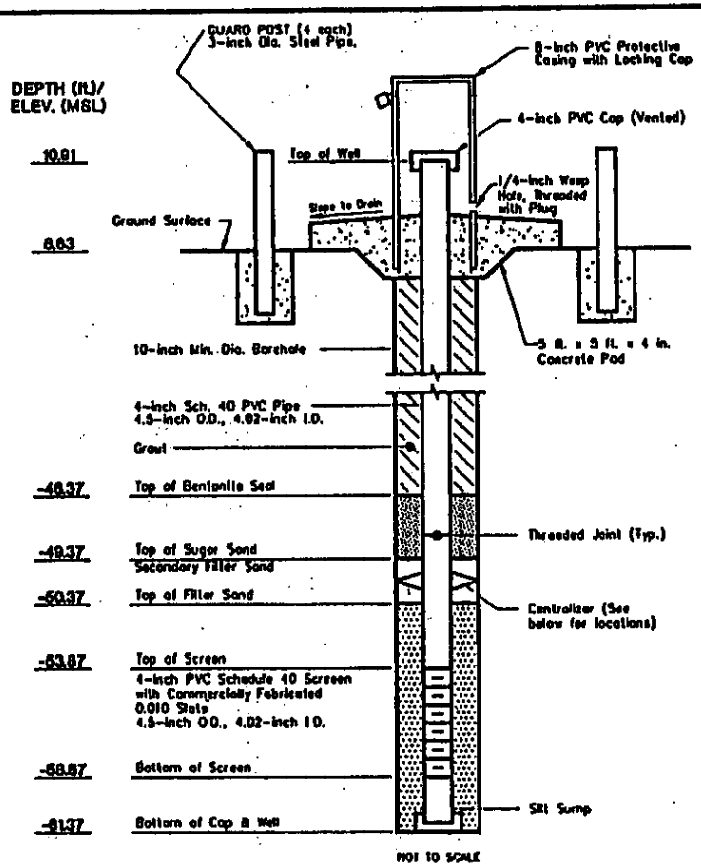
BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA Lake Charles, LA Jackson, MS

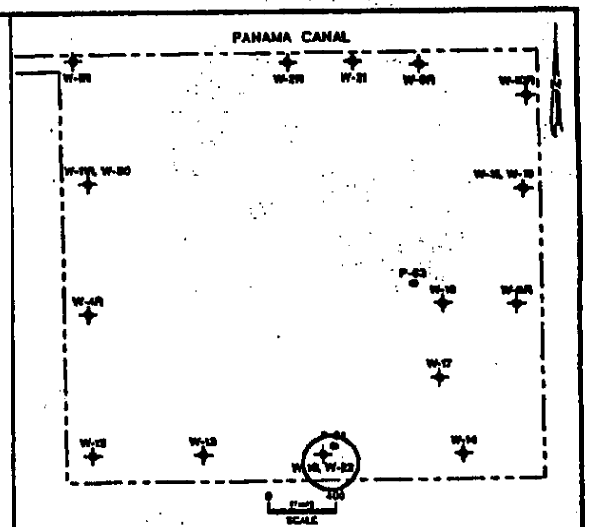
Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 9-17-93	Figure No.:

Title: **WELL DIAGRAM MONITOR WELL W-21**





WELL NO. W-22



WELL LOCATION

LAT : 30° 08' 34"
LONG: 90° 51' 38"

Date Well Installed 11/10/92

Action Taken after Grout Inspection:
Grout Ok!

Protective Casing Type/Size 8-inch PVC

Stainless Steel Compression Controllizers (if any)
Located at 18', 33', 48', 63' & 69' B.O.S.

PIPE
6 ea. 10' Pipe — 5 ft. Screen
1 ea. 5' Pipe — 1 Bottom Plugs
2 ea. 2.5' Pipe — 1 Top Caps

GROUT
10 bgs. Volclay
230 gals. Water (Potable)
12:00 am 11/10/92 Date & Time Placed
9.1 wt. Entering Annulus
9.4 wt. Exiting Annulus

BENTONITE SEAL
2 pails of 3/8 in. Pellets
1:35 pm 11/10/92 Date & Time Placed
12± hrs. Hydration Time

FILTER SAND
8.5-50 lb bgs. 20/40 Filter Sand
1:25 pm 11/10/92 Date & Time Placed

SECONDARY FILTER SAND
5 bgs. Sugar Sand (if any)

MONITOR WELL INSTALLATION
COLONIAL LANDFILL
SORRENTO, LOUISIANA

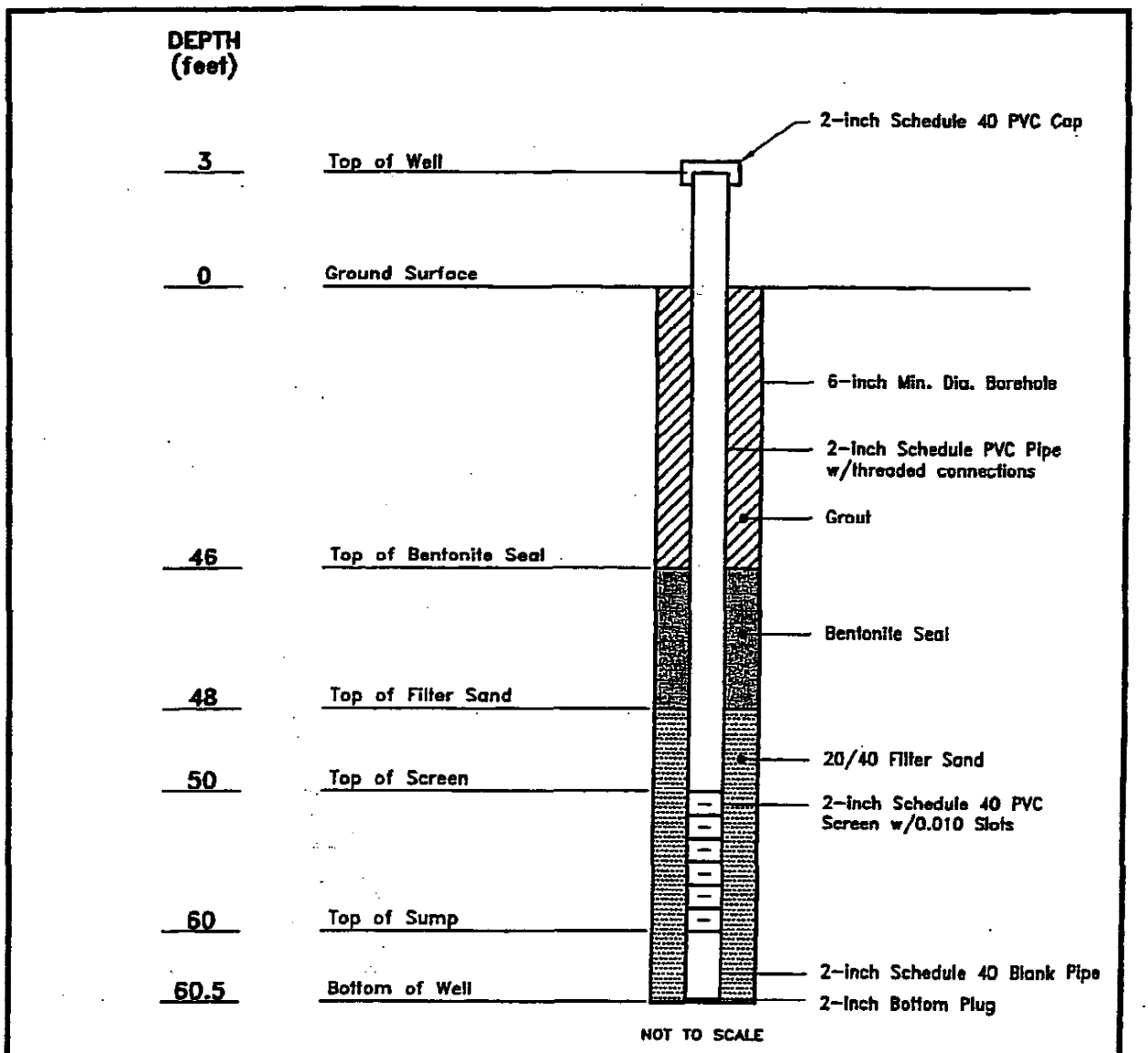
for

BROWNING-FERRIS, INC.
SORRENTO, LOUISIANA
HOUSTON, TEXAS

STE Soil Testing Engineers, Inc.
Baton Rouge, LA · Lake Charles, LA · Jackson, MS

Project Engineer:	Drawn by: DMS	Checked by: JJP
File No.: 92-122	Date: 5-26-93	Figure No.:

Title: WELL DIAGRAM
MONITOR WELL W-22



TEMPORARY PIEZOMETER CDM-1

DATE INSTALLED:
8/17/04

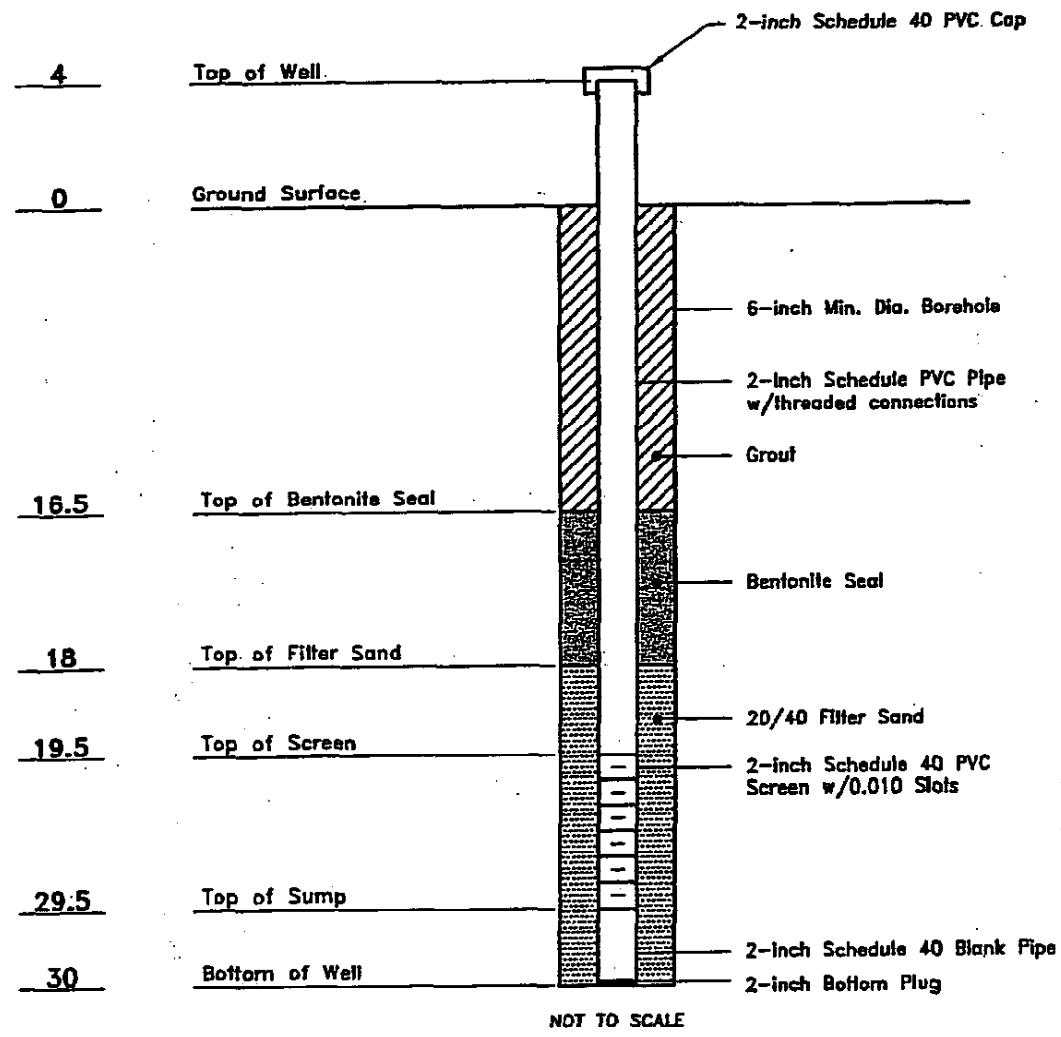
LATITUDE 30° 08' 32.8"
LONGITUDE 90° 51' 53.5"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010

Dec 16, 2004 - 2:19pm

P:\2004\04-3010\CADD\043010 PZ CDM-01.DWG



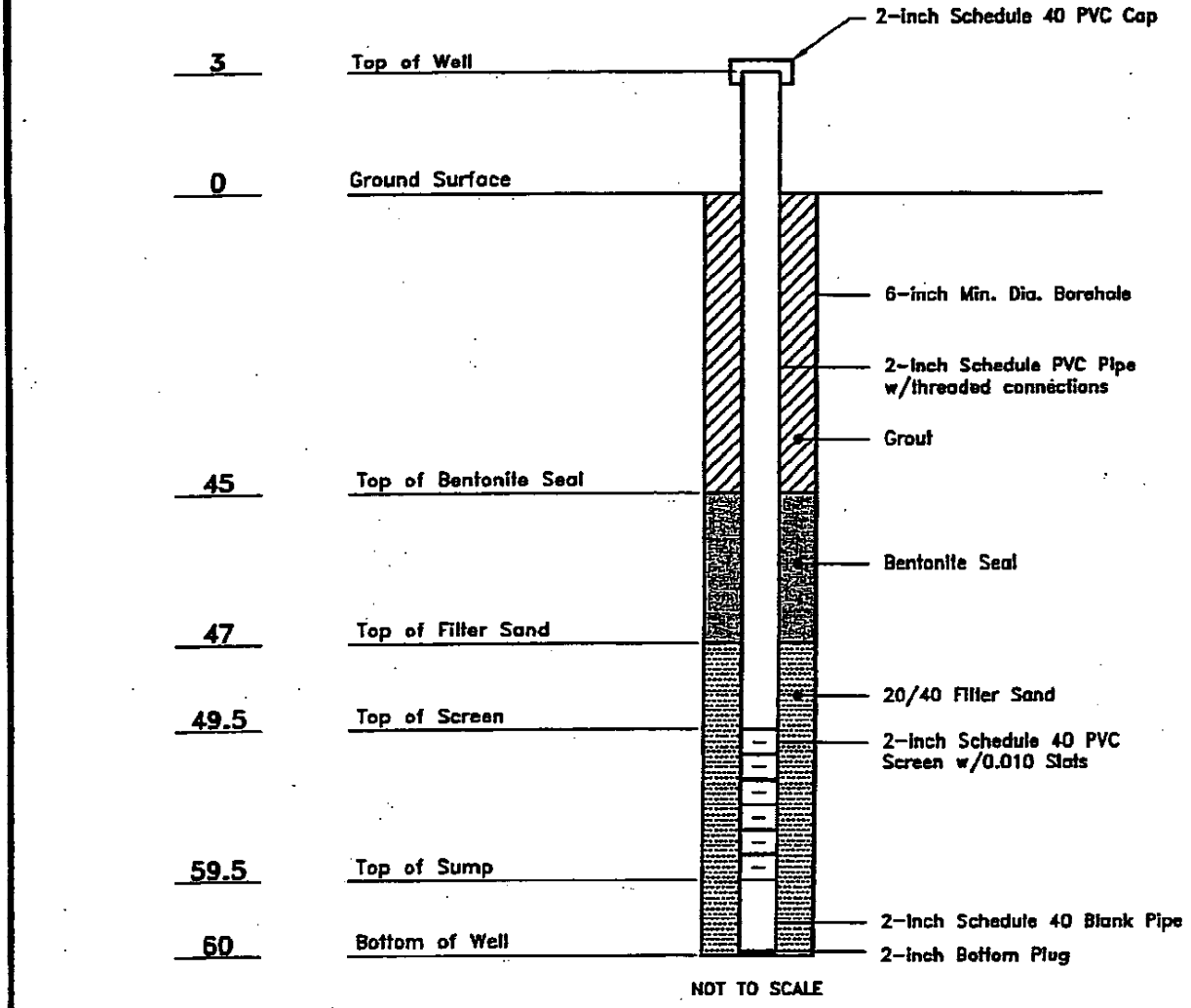
TEMPORARY PIEZOMETER CDM-11

DATE INSTALLED:
9/20/04

LATITUDE 30° 08' 28.5"
LONGITUDE 90° 51' 37.9"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010



TEMPORARY PIEZOMETER CDM-22

DATE INSTALLED:
8/23/04

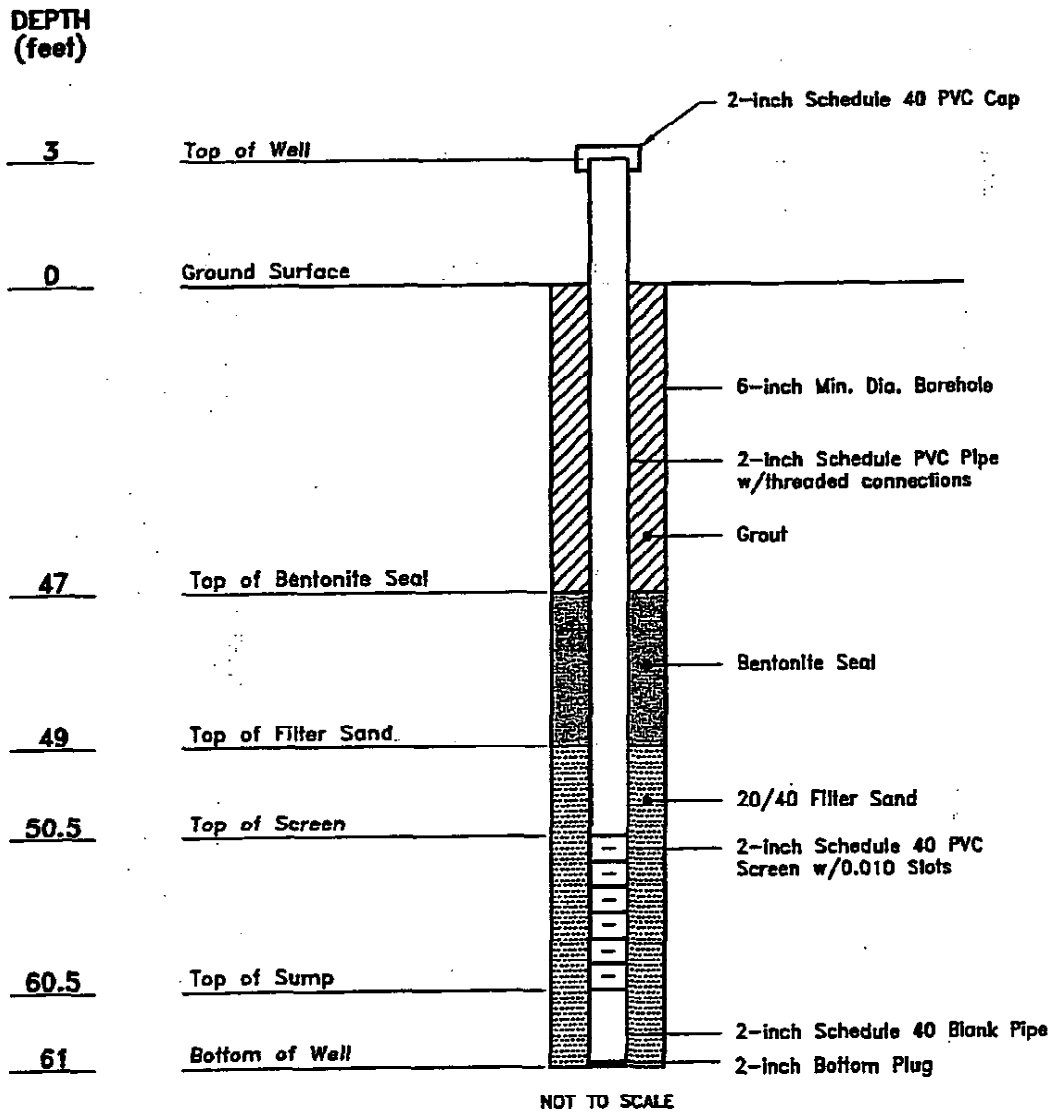
LATITUDE 30° 08' 22.6"
LONGITUDE 90° 51' 53.3"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010

Dec 16, 2004 - 2:21pm

P:\2004\04-3010\CADD\043010 PZ CDM-22.DWG



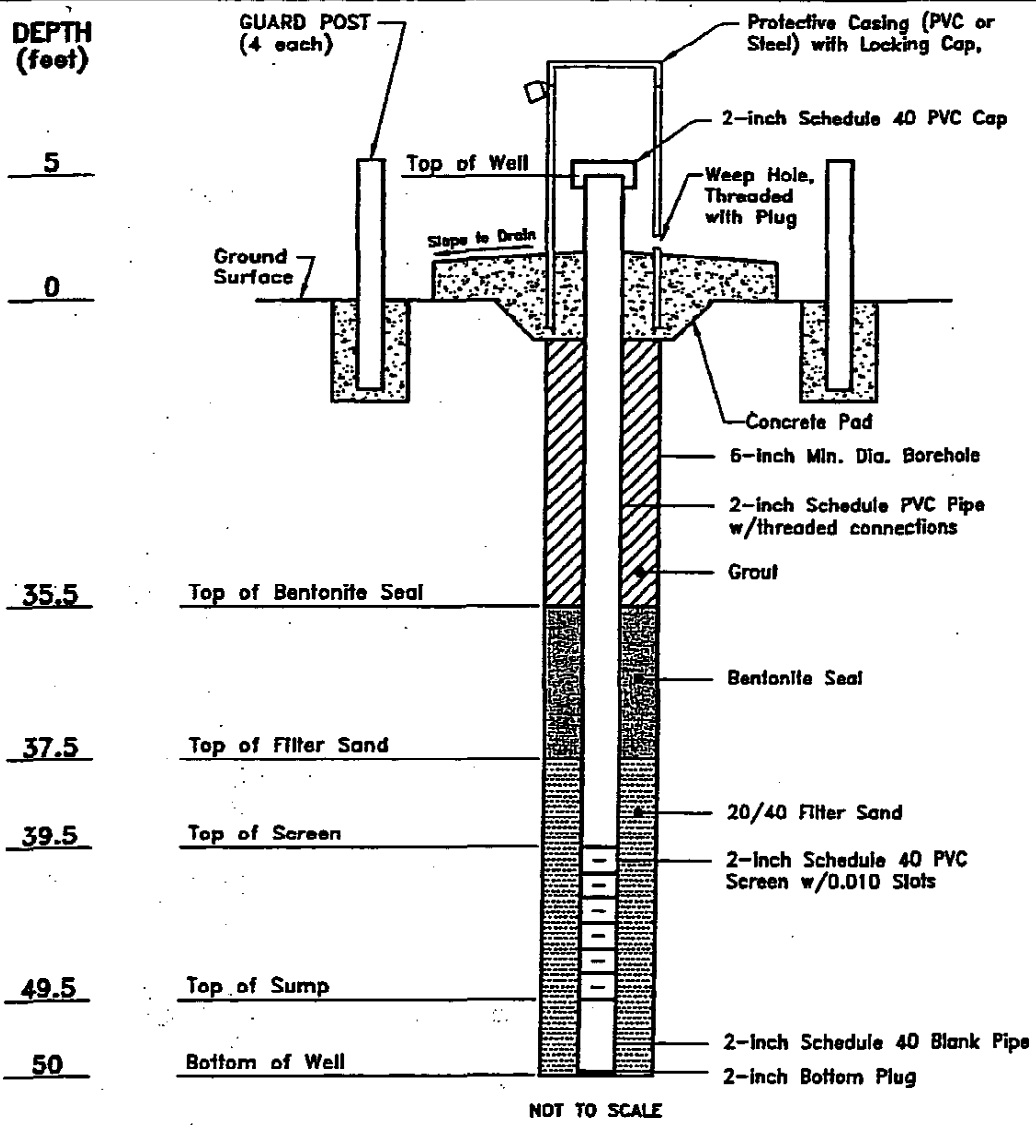
TEMPORARY PIEZOMETER CDM-23

DATE INSTALLED:
9/22/04

LATITUDE 30° 08' 20.0"
LONGITUDE 90° 51' 32.8"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010



MONITOR WELL CDM-24

DATE INSTALLED:
9/10/04

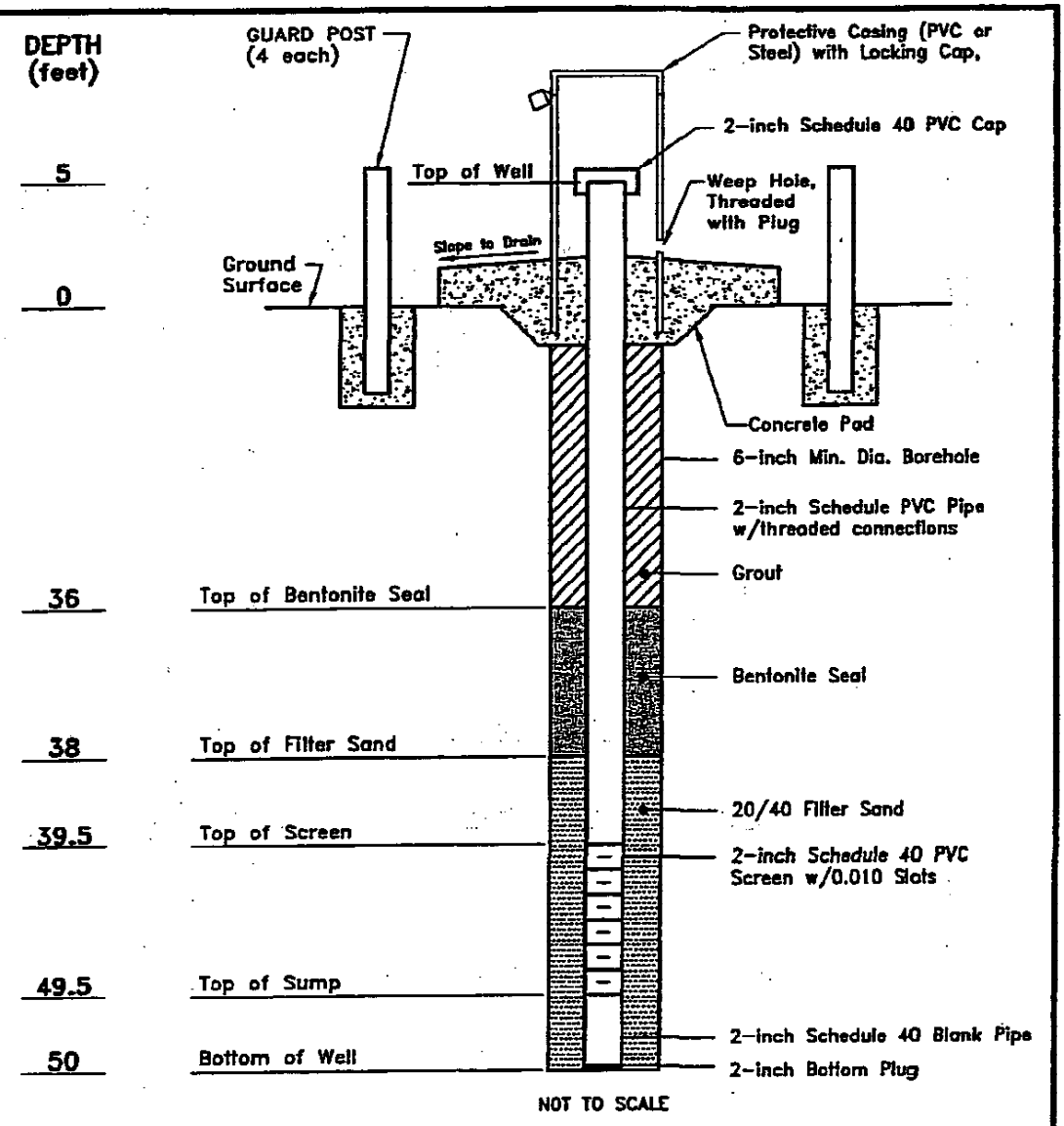
LATITUDE 30° 08' 20.1"
LONGITUDE 90° 51' 20.9"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010

Dec 16, 2004 - 2:25pm

P:\2004\04-3010\CADD\043010 MW CDM-24.DWG



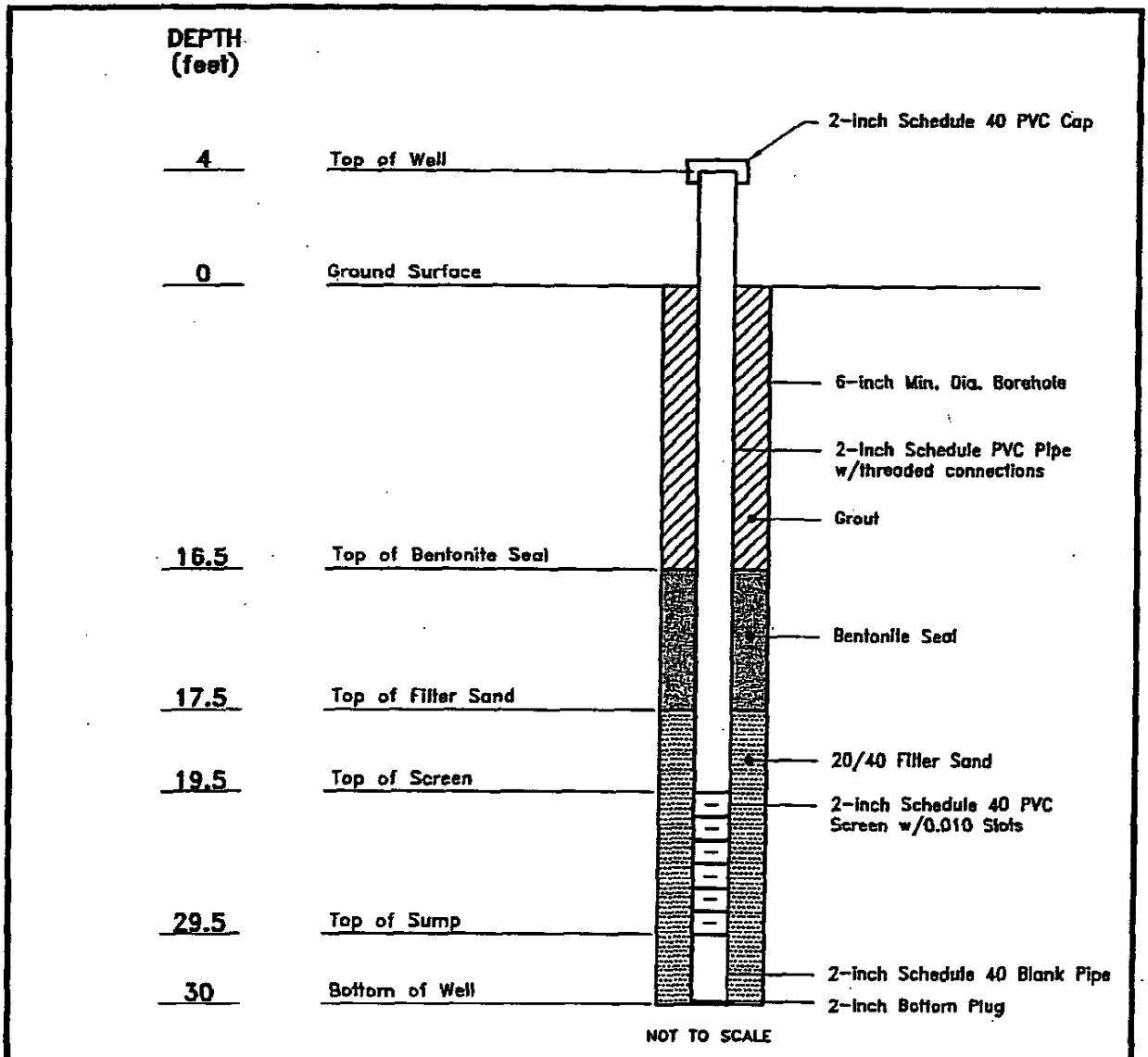
MONITOR WELL CDM-25

DATE INSTALLED:
9/11/04

LATITUDE 30° 08' 20.1"
LONGITUDE 90° 51' 37.1"

STE
Soil Testing Engineers, Inc.

PROJECT: BFI COLONIAL LANDFILL
LOCATION: SORRENTO, LA
JOB NO.: 04-3010



TEMPORARY PIEZOMETER CDM-26

DATE INSTALLED:
9/22/04

LATITUDE 30° 08' 20.0"
LONGITUDE 90° 51' 27.7"

STE
Soil Testing Engineers, Inc.

PROJECT : BFI COLONIAL LANDFILL
LOCATION : SORRENTO, LA
JOB NO. : 04-3010

Dec 15, 2004 - 2:22pm

P:\2004\04-3010\CADD\043010 PZ CDM-26.DWG

APPENDIX X

SAFETY-EMERGENCY - CONTINGENCY PLAN

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
ASCENSION PARISH

SAFETY-EMERGENCY-CONTINGENCY PLAN

JUNE 2007

Prepared By:

PROVIDENCE

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, LA 70802
(225) 766-7400

Providence Engineering Project No. 018-005-016

TABLE OF CONTENTS

BFI COLONIAL LANDFILL
SAFETY – EMERGENCY CONTINGENCY PLAN

1.0 GENERAL

The Plan is designed to minimize hazards to human health or the environment due to accidents, fires, explosions, release of known/suspected hazardous waste to the air, soil or surface water, etc. Operational safety elements of this plan are applicable at all times; the emergency/contingency elements of this plan will be implemented whenever there is a threatening situation.

2.0 DISTRIBUTION

This plan will be provided to the following:

- Louisiana Department of Environmental Quality

  Permits Division
  P.O. Box 4313
  Baton Rouge, LA 70821-4313
  Phone: (225) 219-3181

- Fire Department(s)

  Sorrento: P.O. Box 522, Sorrento, LA
  Phone: 911 (225) 675-8668

- Hospitals

  St. Elizabeth Hospital
  1125 West Highway 30
  Gonzales, LA 70737
  (225) 647-5000

  Ascension Hospital
  615 E. Worthey Road
  Gonzales, LA 70737
  (225) 621-1200

3.0 AMENDMENT OF PLAN

The plan will be reviewed and amended if necessary, annually or whenever:

- The landfill permit is revised
- The facility operations are changed significantly
- The plan personnel and/or equipment change

The plan will be updated annually or when implementation demonstrates that a revision is needed.

4.0 DIRECTION AND CONTROL

At all times during facility operation there will be at least one employee on the landfill site who is trained in emergency procedures and who is in charge of all immediate emergency response measures and notification of others. In the event of an incident/accident at the landfill site, the Landfill Manager will direct and control incident/accident response activity.

The Landfill Manager is thoroughly familiar with all aspects of the landfill site, the location and characteristics of waste, site layout, and the response procedure for various emergency situations. In addition, the Landfill Manager will have the authority to implement the emergency/contingency procedures described herein.

5.0 EQUIPMENT

Equipment is maintained at the landfill site, which may be used in emergency cases.

6.0 EMERGENCY PROCEDURES

Whenever there is an imminent or actual unsafe or emergency situation, the Landfill Manager will take immediate action as prescribed herein for the appropriate type of situation. Applicable to all emergency response is the requirement to contact the Landfill Manager at the earliest possible moment.

A site plan(s) showing evacuation route, five extinguishers, and first aid kit, will be kept onsite and revised as necessary.

7.0 REPORTING

The Landfill Manager will complete an incident/accident report after the fact and distribute copies of the report to the appropriate landfill personnel.

8.0 EMERGENCY TELEPHONE NUMBERS

The following is a ready reference of emergency telephone numbers:

Hospitals

St. Elizabeth Hospital
1125 West Highway 30
Gonzales, LA 70737
(225) 647-5000

Sheriff Department		911	(225) 621-8300
Fire Department	Sorrento	911	(225) 675-8668
	Gonzales	911	(225) 647-8443
	Donaldsonville	911	(225) 473-8686
LDEQ	Permits Division	(225) 219-3181	
National Response Center		(800) 424-8802	

Changes or additions to the above emergency telephone numbers list will be made as necessary to keep the list current.

The local fire department, emergency medical services agency, and local hospital can meet the requirement of R.S. 30:2157.B.

Operational Safety

General

The landfill will at all times be operated in a safe and responsible manner. The Landfill Manager is directly responsible for the safe operation of the landfill facility. Operational safety includes, but is not limited to, the below listed.

1. Attendance
   The landfill site will not be left unattended during hours of operation.

2. Communications
   Telephone and two-way radio communications will be maintained at all times during the operation of the landfill.

3. Security
   The landfill will be secured by locking the front gates whenever the landfill is not in operation.

4. Unauthorized Personnel
   No persons will be permitted on the landfill without a reason (e.g., disposing of trash, garbage, etc.)

5. Smoking and Fires
   Smoking and/or fires will not be permitted in the active face of the landfill.

6. Equipment Operation
   All landfill equipment, including those vehicles that transport waste to the site, will be operated in a safe and responsible manner.

7. Liquid Waste
   No liquid waste will be accepted for disposal in the active face.

8. Regulated Hazardous Waste
   Suspected hazardous waste will not be accepted for disposal at the landfill.

9. Safety Equipment
   Appropriate safety equipment will be worn in all applicable areas.

10. OSHA
    Landfill personnel will comply with the safety requirements of the Occupational Safety and Health Administration.

    First aid kits and functional fire extinguishers will be available on site at all times.

Response to Injury

General

Injury to persons at the landfill site may consist of burns, cuts, abrasions, sprains, broken bones, gas or smoke inhalation, etc. The site supervisor or designee will be trained in basic first aid techniques. A complete first aid kit will be maintained at the landfill site whenever the site is in operation. Due to the nature of injuries to persons, the Landfill Manager or designee will have to make judgments as to what action should be taken to care for injury. The extent of action taken will be highly dependent upon the nature and seriousness of the injury. In any event, the site supervisor will contact the Landfill Manager as soon as possible after an injury has been sustained on the site.

Emergency Procedures

The following procedures apply to injuries sustained at the landfill site.

1. For minor injury (small cuts, bruised, etc.) first aid administration on site will usually suffice. The injured party will be advised to see a physician as soon as possible following on site treatment.

2. For non-minor injury, the site supervisor will take immediate appropriate action. If the injured part can be safely moved, he will be escorted to the nearest hospital/clinic. If the injured party is incapacitated, or otherwise should not be moved by landfill personnel, the Landfill Manager/designee will immediately contact the hospital and request ambulance pick-up of the injured party.

3. The site supervisor will make a record in his daily work log and brief the appropriate person as to all details applicable to the injury (who sustained the injury, nature of injury, time, etc.)

Note: The site supervisor and/or Landfill Manager will submit the necessary reports and involve other agencies (e.g., fire department etc.) as the incident requires.

Response to Fire

General

An uncontrolled fire is an unplanned destructive burning. In case of most uncontrolled fires, the initial response will be to confine the fire and to see that the fire fighting units are dispatched as soon as possible to the site to put the fire out. It is likely that very small fires and fires involving equipment can be put out by use of portable fire extinguishers on site. In any event, in the case of fire at the landfill site, the site Manager or Supervisor will dispatch fire fighting equipment.

Emergency Procedure

The following procedures apply to fires at the landfill site.

1. Removal of all personnel and equipment (not involved in fighting the fire) to a safe location.

2. The site supervisor will contact the Landfill Manager and advise him of the character, location, and the extent of the burning area.

3. The Landfill Manager will call for the fire fighting assistance sufficient to bring the burning area under control and extinguish the fire.

4. The Landfill Manager (with input from the Fire Department). will assess possible hazards to human health or the environment resulting from the fire (e.g., the effect of any toxic, irritating, or asphyxiating gases generated by the fire and the effects of chemical agents that may be used to control the fire).

5. During the emergency, the Landfill Manager will take all reasonable precautions to ensure that the fire does not recur, spread, or cause other problems. This may entail stopping the landfill operation, collecting and containing burned debris, etc.

6. If fire stops the landfill operation, the Landfill Manager will monitor the site and make the final determination (with input from others as necessary) that the operation can start up again.

7. The Landfill Manager will ensure that:
   - Clean-up procedures after the fire are properly completed.
   - All emergency equipment used to fight the fire is cleaned and/or refitted for future use.

8. The site supervisor will make a record of the fire incident in his daily work log.

Note: The Landfill Manager will submit the necessary reports and involve other agencies (e.g., Sheriff Department, Hospital) as the incident requires.

Response to Explosion

General

An explosion is a large scale, rapid, and spectacular expansion, outbreak, or other upheaval of matter, such as the violent explosion of gases or chemicals. An explosion will often be accompanied by fire(s) and/or injury in the case of explosion, the site Supervisor/Landfill Manager will contact the District Manager as soon as possible. Generally, as a minimum, it will be necessary to involve both the Sheriff's Department and the Fire Department after any explosion.

Emergency Procedure

The following procedures apply to explosions at the landfill site.

1. The site supervisor will remove all personnel and equipment to a safe location.

2. The site supervisor will contact the Landfill Manager and advise him of the character, location; and the extent of the explosion and' if any fires have started, where, and to what extent.

3. The Landfill Manager will call the Sheriff Department and the Fire Department to assess the nature of the explosion and for fire fighting assistance necessary to bring any burning areas under control and extinguish the fires.

4. The Landfill Manager (with input form the appropriate agencies) will assess possible hazards to human health or the environment resulting from the explosion or fire (*e.g.*, the effect of any toxic, irritating, or asphyxiating gases generated by the explosion or resulting fire and the effects of chemical agents that may be used to control the explosion).

5. During the emergency, the Landfill Manager will take all reasonable precautions to ensure that additional explosions do not recur, spread, or cause other problems. This may entail stopping the landfill operation, collecting and containing burned debris, etc.

6. If the explosion or resulting fire stops the landfill operation, the Landfill Manager will monitor the site and make the final determination (with input from others as necessary) that the operation can start up again.

7. The Landfill Manager will ensure that:

    - Clean-up procedures after the incident are properly completed.

    - All emergency equipment used to fight the fire is cleaned and/or refitted for future use.

8. The site supervisor will make a record of the explosion incident in his daily work log.

Note: The Landfill Manager will submit the necessary reports and involve other agencies (e.g., Sheriff Department, Hospital) as the incident requires.

Response to Gas

General

Gas is a fluid that is independent of shape and volume and tends to expand indefinitely. Certain gases pose a threat to human health and the environment due to their flammability, toxicity, and/or asphyxiating nature. Unless unauthorized waste material are disposed of in the landfill, the gases that would be expected to be present at the landfill would be methane gas (odorless), carbon dioxide (odorless), hydrogen sulfide (rotten egg smell). These gases will form in the landfill cells as a result of biodegradation of organic material. The planned methods of landfill operation (daily and final cover) should preclude the escape of sufficient methane gas or other gases to pose a threat to human health or the environment.

In the event of a known or suspected gas threat at the landfill site, the Supervisor/Landfill Manager will clear the area of all personnel. The Landfill Manager/Designee will contact, among other agencies, the appropriate division of the Louisiana Department of Environmental Quality (LDEQ), in order that a team of specialists can be dispatched to the site to evaluate the nature, extent, and remedial response to the gas threat. Absolutely no smoking or starting of fires will be permitted during a gas threat incident.

Emergency Procedure

The following procedures apply to a gas threat at the landfill site.

1. Removal of all personnel and equipment to a safe location.

2. The site supervisor will contact the Landfill Manager and advise him of the character, location, and the extent of the gas threat.

3. The Landfill Manager will call for assistance from LDEQ and BFI's Regional and Corporate Office.

4. The Landfill Manager (with input from the LDEQ) will assess possible hazards to human health or the environment resulting from the gas threat (e.g., the effect of any toxic, irritating, or asphyxiating gases).

5. During the emergency, the Landfill Manager will take all reasonable precautions to ensure that the gas threat does not recur, spread, or cause other problems. This may entail stopping the landfill operation.

6. If the gas threat stops the landfill operation, the Landfill Manager will monitor the site and make the final determination (with input from others as necessary) that the operation can start up again.

7. The Landfill Manager will ensure that:

   - Clean-up procedures after the gas threat are properly completed.
   - All emergency equipment used to treat the gas threat is cleaned and/or refitted for future use.

8. The site supervisor will make a record of the gas threat incident in his daily work log.

Note: The Landfill Manager will submit the necessary reports and involve other agencies (e.g., Sheriff Department, Hospital) as the incident requires.

Response to Release of Hazardous Waste

General

The landfill is prohibited from receiving regulated hazardous wastes. Waste shipments to the landfill containing hazardous or non-conforming waste will not be accepted. In the event hazardous waste is known/suspected to have been dumped in the landfill, the site supervisor will contact the Landfill Manager as soon as possible and discontinue landfilling in the affected area(s).

Emergency Procedure

The following procedures apply to hazardous waste at the landfill site.

1. Removal of all personnel and equipment from the known/suspected hazardous waste area(s).

2. The site supervisor will contact the Landfill Manager and advise him of the character, location, and the extent of the known/suspected hazardous waste area(s).

3. The Landfill Manager will call the LDEQ for assistance identifying the nature, extent, and remedial response necessary.

4. The Landfill Manager (with input from the LDEQ) will assess possible hazards to human health or the environment resulting from the presence of hazardous waste.

5. During the emergency, the Landfill Manager will take all reasonable precautions to ensure that the hazardous waste area does not spread, or cause other problems. This may entail stopping the landfill operation, and transporting the hazardous waste to an approved facility, etc.

6. If the incident stops the landfill operation, the Landfill Manager will monitor the site and make the final determination (with input from others as necessary) that the operation can start up again.

7. The Landfill Manager will ensure that:

   - Clean-up procedures associated with the hazardous waste incident are properly completed.

   - All emergency equipment is cleaned and/or refitted for future use.

8. The site supervisor will make a record of the incident in his daily work log.

NOTE: The Landfill Manager will submit the necessary reports and involve other agencies (e.g., Sheriff Department, Hospital) as the incident requires.

Hurricane and Tornado Procedures

General

Injury to persons at the landfill site caused by natural disasters may consist of cuts, abrasions, sprains, broken bones, etc. The site supervisor or designee will be trained in basic first aid techniques. A complete first aid kit will be maintained at the landfill site whenever the site is in operation. Such situations will be addressed in a reasonable manner. In any event, the site supervisor will contact the Landfill Manager as soon as possible.

Emergency Procedures

The following procedures apply to hurricane and/or tornados at the landfill site.

1. If time permits, the buildings will be evacuated, as directed by the site supervisor or Designee.

2. If time does not permit evacuation, employees should do one of the following:

   - Large Building: Try to reach the first floor level; and if unable, use a closet or small room with stout walls. Stay away from the outside perimeter rooms and go to the inside of the hallway, to give protection from flying objects.

   - Small Building: Try to reach floor level, remain away from windows and outside perimeter rooms.

   - Mobile Trailers: Leave the structure immediately! Seek refuge in the lowest spot available, *i.e.* a ditch, or nearest substantial shelter, unless there are imminent dangers of flooding in your chosen refuge spot.

Groups of employees should stay together until authorized to move back into the office or elsewhere.

Response to Other Emergencies or Unsafe Conditions

General

Situations other than injury, fire, explosion, gas threats, or release of hazardous waste may arise during the life of the landfill operation that will create a threat to human health or the environment. Such situations will be addressed in a reasonable manner. In every instance, the site supervisor will contact the Landfill Manager and advise him of the incident. The Landfill Manager will be responsible for involving those agencies best suited to handle or assist in resolving the particular incident.

Safety Education and Training

1. The Landfill Manager or Designee is responsible for providing safety training for his employees, including inspection and supervisory personnel.

2. Safety meetings will be conducted on the job. Appropriate records of each meeting shall be maintained for inspection at the job site.

3. New employees and seasonal employees will be given training prior to assuming their field assignments. This training will include, but not necessarily be limited to, the following.

    - Nature of job
    - Duties to be performed
    - Tools and equipment to be used
    - Methods of performing the work
    - Hazards involved and how to cope with them
    - Personal Protective Equipment required, such as hard hats, eye protection, safety shoes, etc. All personal protective equipment will be available and in use as needed before the employee assumes his duties.
    - Instruction on reporting injuries, including minor first aid cases

Landfill Managers or Designee will be familiar with the nature of the work; hazards involved and how to deal with them; tools and equipment to be used; applicable safety requirements to be followed; accident prevention measures to be taken; personal protective equipment to be used; and any other information that would help them to safely accomplish the missions. This briefing will be given before a new employee and/or supervisor assumes duty.

EMERGENCY NUMBERS

TO REPORT A FIRE:

Ascension Parish Fire Dept.	911	(225) 647-8443
Sorrento Fire Dept.	911	(225) 675-8668

FOR SHERIFF:

Ascension Parish Sheriff Dept.	911	(225) 621-8300
Sorrento Police Dept.	911	(225) 675-5355

FOR MEDICAL EMERGENCY

St. Elizabeth Hospital
1125 West Highway 30
Gonzales, LA 70737
(225) 647-5000

FOR EMERGENCY AMBULANCE

Acadian Ambulance Service	911	1-800-267-1111 (Toll Free)

NATIONAL EMERGENCY RESPONSE **1-800-424-8802**

POISON INFORMATION RESPONSE: **1-800-256-9822**

APPENDIX Y

TRAINING PLAN

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
ASCENSION PARISH

TRAINING PLAN

JUNE 2007

Prepared By:

PROVIDENCE

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, LA 70802
(225) 766-7400

Providence Engineering Project No. 018-005-016

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LIST OF ATTACHMENTS

1.0 INTRODUCTION

This plan is provided as a management tool, and it shall be used as a guideline for training employees at the Colonial Landfill (hereafter referred to as the "Landfill").

This plan is not inclusive of all the training that may be given to the employees; however, it gives direction and shall be utilized by the management of BFI Waste Systems of Louisiana, Inc (hereafter referred to as "BFI") in order to insure safe and effective work practices at the landfill.

This plan and list of training subjects will be changed as needed in order to meet regulatory requirements, permit conditions, BFI policy changes, and changes in site conditions.

2.0 RESPONSIBLE PERSONS

The BFI District Manager and the Environmental Manager and/or their designees are responsible for the implementation of this plan and any revisions that may be required.

Designees usually include but are not limited to the following:

1. Landfill Managers/Supervisors
2. Site Supervisors
3. Site Coordinators

Each employee at the landfill will have training based on the following:

1. Regulatory Requirements
2. Permit Requirements
3. BFI Policy Requirements
4. Employee Needs

A complete list, Training Subjects, is provided as follows:

1. Job Duty/Orientation
2. Hazard Communication
3. Hearing Conservation
4. Personal Protective Equipment
5. Lock Out/Tag Out
6. Asbestos Handling And Spill Response
7. Spill Prevention, Control, And Countermeasure Plan
8. Radiation Screening And Safety
9. Occupational Heat And Cold Stress Management
10. Spotter Safety
11. Fire Prevention And Control
12. Respiratory Protection

13. Cpr/First Aid
14. Hazardous, PCB, And Unauthorized Waste Recognition
15. Substance Abuse And Policy
16. Environmental, Health, And Safety Policy
17. Regulatory Requirements
18. Landfill Operations
19. Accident Prevention
20. Special BFI Programs (Varies From Year To Year)

Note: This list of training subjects will be changed as needed in order to meet the regulatory requirements, permit conditions, BFI policy changes, and changes in site conditions.

3.0 TRAINING SCHEDULE

Periodic safety meetings insure that each employee receives his/her training in accordance with this plan, regulatory requirements, permit conditions, and BFI policy.

4.0 RETRAINING

Retraining shall be given to the employees when there is a need and/or it is essential to meet regulatory requirements, permit conditions, and BFI policy.

5.0 RECORDKEEPING

An Attendance Roster or an equivalent form shall be used to record each employee's attendance (**Attachment 1**). The Employee Meeting Record or an equivalent form shall be used to log the details and attendance of each safety meeting (**Attachments 2**).

6.0 SUMMARY

Videos, visual aids, and handouts may occasionally be utilized during training classes which will help the employee to retain the information presented. These items will also aid the employee to understand the importance of being safe and in compliance.

ATTACHMENT 1

ATTENDANCE ROSTER

Have employees sign-in at the beginning of each meeting. At the completion of the meeting, have the employee's name and social security number printed or typed next to his/her signature.

DATE

PROGRAM

EMPLOYEE SIGNATURE	SOCIAL SECURITY NUMBER	EMPLOYEE NAME (PRINT OR TYPE)	INPUT CODE
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
15.			
16.			
4.			
18.			
0.			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
0.			
1.			
3.			
4.			

ATTACHMENT 2

EMPLOYEE MEETING RECORD

DISTRICT _____ DISTRICT NUMBER ___-___ CITY _____

DATE _____ TIME _____ PLACE _____

CHAIRMAN _____ SUPERVISOR/INSTRUCTOR _____

GUEST(S) _____ _____

_____ _____

EMPLOYEES: (Number Attending Meeting)

Drivers _____ Helpers _____ Mechanics _____ Equipment Operators _____ Other _____

TYPE OF MEETING _____

General/Safety/Training/Awards/Departmental/Supervisors

PROCEEDINGS

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ _____

Signature of Secretary Signature of Chairman

NOTE: 1) Proceedings should be itemized 2) List items or subjects to be discussed prior to meeting-then have employees sign reverse side 3) Indicate specific type of meeting (general, departmental, training program, awards banquet, etc.)

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APPENDIX Z

OPERATIONAL PLAN

BFI WASTE SYSTEMS OF LOUISIANA, LLC
COLONIAL LANDFILL
SORRENTO, LOUISIANA
ASCENSION PARISH

COMPREHENSIVE OPERATIONAL PLAN

JUNE 2007

Prepared By:

PROVIDENCE

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Providence Engineering Project No. 018-005-016

TABLE OF CONTENTS

1.0 INTRODUCTION

BFI Waste Systems of Louisiana, LLC (BFI) Colonial Landfill is located in Sorrento, Louisiana in Section 42, Township 10 South and Range 3 East in Ascension Parish.

The primary function of the landfill is to contain, in an environmentally safe manner, solid waste material. Regulated hazardous wastes are not disposed in the landfill.

2.0 BACKGROUND

Colonial Landfill is located on Louisiana Highway 70, Sorrento, Louisiana, approximately 1 mile south of Louisiana Highway 22. Access to the facility is by all-weather roads that meet the demands of the facility. The roads are designed to avoid, to the extent practicable, congestion, sharp turns, obstructions or other hazards conducive to accidents. In addition to natural and manmade barriers to unauthorized entry, the property is posted.

3.0 REQUIREMENTS

Proper environmental, safety, and process training are maintained to ensure that proper control is maintained over the landfill facility in accordance with the facility's permit as well as the Louisiana Department of Environmental Quality (LDEQ) Solid Waste Rules and Regulations.

4.0 OVERVIEW OF FACILITY

The landfill is divided into three areas, Area I, II, and III.

Area I is closed. Area II consists of the active disposal Area II and includes future disposal areas IIA (former leachate pond) and IIB (former mixing basin area). Area III will be constructed adjacent to the existing landfill to ease construction and access, to facilitate storm water and leachate management, and to reduce the impact on the surrounding environment.

5.0 EQUIPMENT

Sufficient equipment will be provided and maintained to meet the operational needs of the facility.

The facility will cease operations if equipment that is essential for proper and safe operation of the landfill is inoperable. If necessary, similar equipment will be obtained through local suppliers to operate the facility until the equipment is repaired or permanently replaced.

In the event that a haul truck breakdown occurs on the way to the landfill, the truck will be repaired or the truck's load will be transferred to another haul truck

and then transported to the landfill. At all times, the solid waste loads will be disposed of in the landfill and at no time will a load be released along the haul route.

Operations will not continue until the equipment has been repaired or replaced and proper, safe operations can be ensured. If necessary, similar equipment will be obtained through local suppliers to operate the facility until the equipment is repaired or permanently replaced.

6.0 PERSONNEL

BFI will maintain the personnel necessary to achieve the operational requirements of the facility.

Personnel are trained to identify acceptable and non-acceptable wastes and are required to ensure that only appropriate wastes are disposed of in the solid waste landfill. Landfill personnel will inspect the contents of each truck and record the type, quantity, and source of waste material. Landfill personnel will ensure that the wastes deposited in the facility are only approved wastes. If the landfill operator identifies an unacceptable waste, the operator will contact the appropriate BFI representative to arrange for appropriate off-site disposal.

The Landfill Manager will have the overall responsibility for day-to-day activities. The landfill operator will have the authority to accept or reject a truck load of waste based on the protocol. The operator will determine where each truck is to unload, and will also direct efforts to spread and compact the waste. This requires that he be familiar with the landfill design, *e.g.*, lift depths, sequence of fill, and final grade elevations. The operator will be responsible for landfill appurtenances, such as the leachate collection system, storm water pumps, and storm water retention pond(s).

7.0 SURFACE WATER RUN-OFF

Rainwater that falls inside the active portions of the landfill and comes in contact with refuse is contained within lined areas and diverted to on-site tanks, the existing leachate pond or a wastewater treatment system. The landfill utilizes a leachate collection system to remove any contaminated storm water that may accumulate in the landfill. All contact storm water is treated and/or disposed off-site.

The facility has been designed to preclude runoff that has come into contact with waste from leaving the facility. This water will be treated as leachate and collected in the leachate collection and removal system. Therefore, the only non-contaminated surface runoff is from areas capped with interim compacted or final cover.

The perimeter levee, ditch system, and drainage systems will be visually checked by landfill personnel at least once each week and after each major storm event.

8.0 LINER SYSTEM

Per the Louisiana Administrative Code (LAC) at LAC 33:VII.711.B.5.a, the standards for liners in LAC 33:VII.711.B.5 only apply to Areas II (including IIA and IIB) and III.

A Quality Assurance/Quality Control (QA/QC) Plan for composite liner construction is included in the permit application.

The liner system is comprised of two main components. The first component of the liner system for the landfill is the leachate collection system. Underlying the leachate collection system is a composite liner, which is the second major component of the liner system.

9.0 LEACHATE COLLECTION

Original construction plans for Area I show the northern half and the eastern portion of the southern half of Area I having been excavated with one percent (1%) slope to the south. In both of these areas, leachate, rainwater, and seepage water was collected in temporary sumps constructed in the bottom of the excavation. Water collected in these sumps was pumped to the holding facility for treatment in accordance with the state discharge permit. When each area was filled, the sump was filled with waste and abandoned.

As shown in Appendix H of the permit application, the western portion of the southern half of Area I was constructed with a leachate collection system consisting of leachate lines extending in an east to west direction and sloping at 0.005 feet per foot (ft/ft) to a leachate collection manhole. The bottom of the excavation sloped toward the leachate lines at two percent (2%).

The location of the collection/treatment/removal system for Areas IIA, IIB, and III are shown in Appendix I of the permit application. As can be seen by the referenced appendices, the construction of the leachate collection system varied in Areas I and II, but basically consisted of a network of perforated piping to facilitate leachate drainage in areas where leachate collection was required at the time of construction. Areas IIA, IIB, and III are designed with minimum six-inch diameter perforated collection pipes placed on 200-foot centers and graded to the perimeter of the landfill at a minimum 1-percent slope. The landfill bottom is configured with a minimum 2-percent slope toward the collection pipes.

Leachate collected from all areas of the landfill will be pumped to the leachate storage tanks or future wastewater treatment system. All areas with a composite liner system are designed to remain pumped down to less than one foot of head above the liner system. During the construction of Area IIA and III, clean out extensions will be provided as shown on the Area II Leachate Tie-In drawings included in Figure 8 of Appendix I of the permit application.

Representative samples of raw leachate will be collected and analyzed annually for the parameters that are required for the groundwater monitoring wells in LAC 33:VII.709.E.4.

10.0 DIKES

The solid waste disposal facility is designed with a phase delineation berm, which delineates the edge of the active phase and a perimeter berm. Together, these berms prevent surface drainage through the active operating area of the facility. In addition, storm water resulting from precipitation falling within the perimeter berm on an active phase or on the completed liner of the subsequent phase will be routed to the leachate collection and removal system.

11.0 GROUNDWATER ISOLATION

The detection monitoring program consists of 11 Zone 2 wells and 11 Zone 3 wells. A list of monitor wells and monitor well information is presented in Table 1 of the Groundwater Sampling and Analysis Plan (GWSAP). The locations of the wells are shown on Figure 1 of the GWSAP.

After establishment of background values, sampling and analysis for both upgradient and downgradient detection monitoring wells will be conducted on a semi-annual basis for constituents listed in Appendix A, Table 1 of the GWSAP.

12.0 FINAL COVER

During the operational life of the facility, closure of completed areas (*i.e.* areas that have reached final grade) will be accomplished on an ongoing basis. Each completed area will have recompacted clay or a geosynthetic clay liner system installed within 180 days after reaching final grade. Final closure will occur as soon as the gas system is installed. The gas system and synthetic liners will typically be installed after the clay cap is in place.

Prior to placement of final cover, the surface of the waste will be graded and proof-rolled. Any soft or spongy spots will be filled in with cover material and will be properly compacted in connection with placement of the final cover.

Any low spots, due to local settlement, will be filled and standing water removed. The surface will be graded to have a maximum slope of 4 horizontal to 1 vertical, and a minimum slope of 4%.

The final cover system will consist of at least twenty-four inches (24) inches of recompacted clay liner (RCL) having a permeability of less than $1x10^{-7}$ centimeters per second (cm/s) and a 40-mil flexible membrane liner (FML) installed directly over the recompacted clay. The FML will be limited to the flatter portions of the landfill (*i.e.* approximate 4% sloped areas). A minimum of 6" of soil capable of supporting vegetation will cover the entire site.

An alternate to the RCL will be a geosynthetic clay liner (GCL) system, which will consist of a GCL, overlaid by a 40 mil FML and covered by 18" of cover soil. On both the RCL and the GCL, the 40-mil FML will be limited to the flatter portions of the landfill (*i.e.* approximate 4% sloped areas).

Colonial Landfill may utilize other covers that satisfy the purposes of minimizing infiltration of precipitation, fire hazards, odors, vector food and harborage, as well as discouraging scavenging and limiting erosion. Other covers will be approved by the administrative authority prior to use. Any alternate final cover will provide a performance equivalent to or better than the final cover requirements provided in LAC 33:VII.711.E.3.a.ii and iii.

During the closure of each new area of the landfill, the existing gas removal system will be expanded into the area to be closed and connected to the gas flare to reduce the potential for gas migration.

Prior to the placement of the final cover on any portion of a phase, an insect and rodent inspection will be conducted and documented. Extermination measures will be provided if determined necessary through the facility inspection. The final cover will be installed in accordance with the final cover requirements in LAC 33:VII.711.E.3. BFI will contact the administrative authority to arrange a closure inspection. After the closure has received the approval of the administrative authority, BFI will seed and fertilize the cap. Seed mixtures for the cap will be selected to minimize erosion and the composition will be determined at time of planting based upon local conditions.

13.0 WASTES TO BE MANAGED IN THE DISPOSAL FACILITY

BFI follows a QA/QC Plan for waste acceptance and landfill gate. This plan has several functions. A major function is to insure that the facility accepts only those wastes that it can feasibly and legally dispose of under the conditions of its permit and state regulations. A second function of the plan is to assure that received wastes are disposed of in a safe, efficient, and environmentally-sound manner. The QA/QC Plan also provides a method of information recording that facilitates internal control and preparation of status reports for regulatory agencies.

Detailed procedures for waste acceptance and random inspections are found in Appendix K of the permit application.

14.0 RESPONSIBLE PERSONS

General supervision and operation of the landfill areas are provided by the Landfill Manager.

15.0 HOURS OF OPERATION

The normal operating hours of the landfill are as follows: